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DECEMBER 21, 1961

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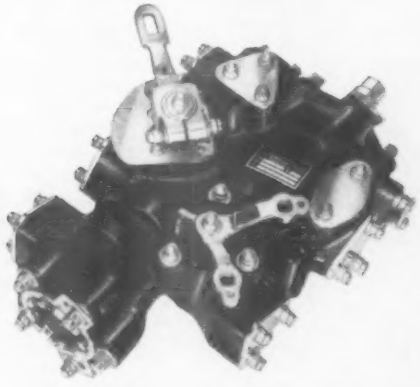

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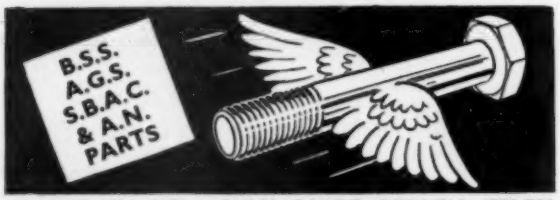

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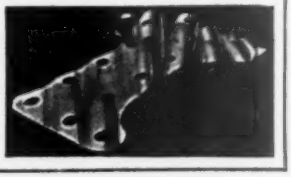

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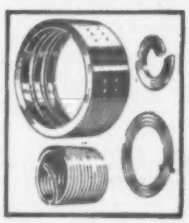

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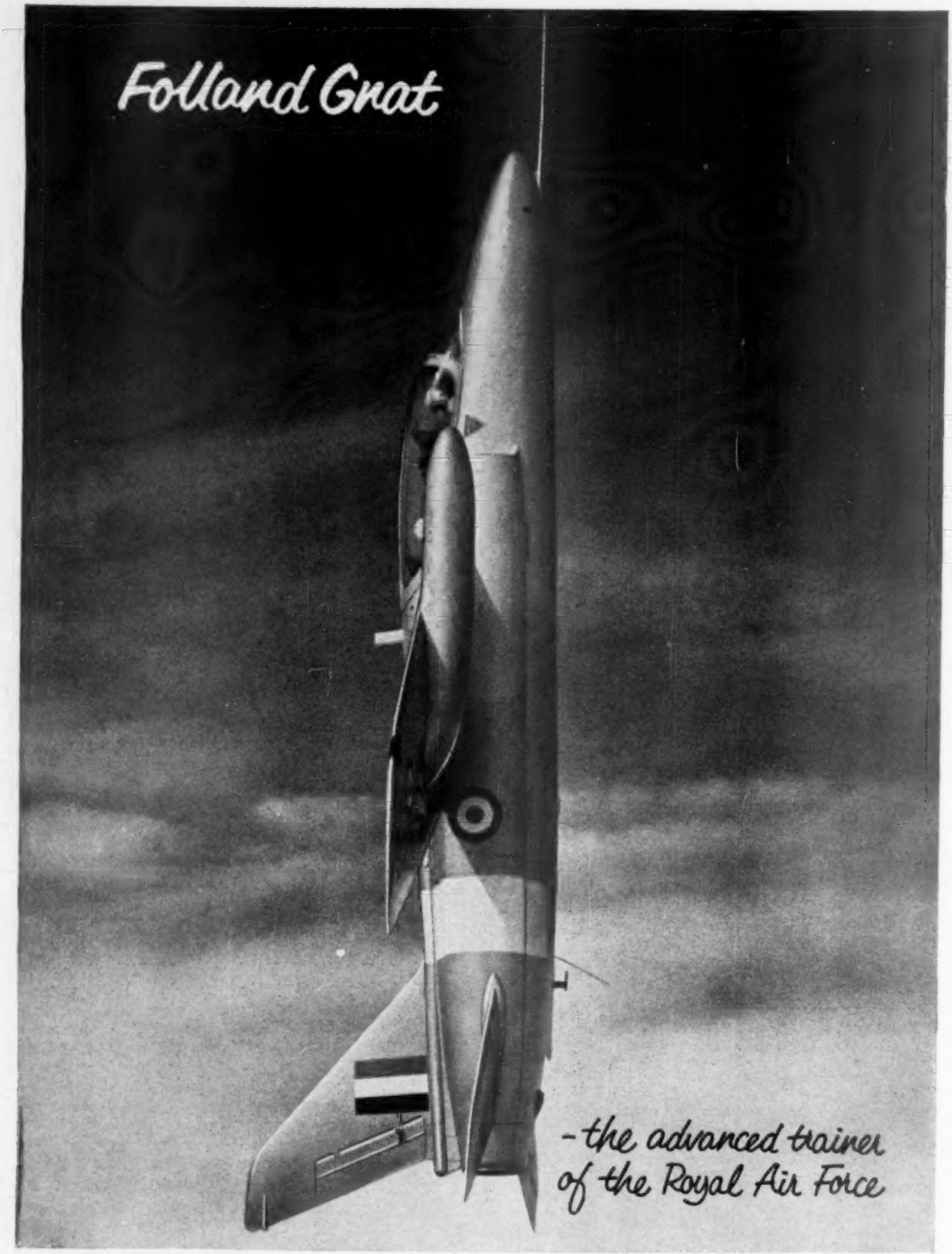

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THE AEROPLANE and ASTRONAUTICS

VOLUME 101 NUMBER 2618 DECEMBER 21, 1961

A Gilbertian Situation

What would an impartial observer without previous knowledge or participation in the aircraft industry make of the present situation? Could he think it other than topsy-turvy? Indeed, the genius of the late W. S. Gilbert would have been hard taxed to have produced anything fictional so strange as today's truth.

Our imagined observer would read in newspapers of unquestioned veracity that a very long-established, in fact the longest-established, aircraft manufacturer in the industry had produced, as a private venture some years ago, an aeroplane which has now been developed to a stage where not only has it been bought by the State and other airlines, but the military authorities would like to purchase a number.

Reading on he would discover that the Ministry having the responsibility of placing such orders was embarrassed. He might then have to conduct some research to find out what was meant by "shot-gun marriages." We know of course that the phrase has been used to cover the manœuvres by which pressure was brought to bear on individual members of the aircraft industry to link in major groups. Our observer might wonder why this was better than the Government resolutely placing orders on merit and leaving the industry to do its own merging.

How strange for him to read that one of the reasons put forward for not ordering the military version of the aircraft is that the Minister would then have to face the reproaches of those who, unlike the long-established manufacturer, had merged together but have yet to receive the orders that mergerization was to produce.

"Well, well," our observer would ejaculate, "how very strange. Why not order an aeroplane built by private enterprise as it does its job extremely successfully?" So successfully, it might be added, that one of them belonging to a State airline is to carry His Royal Highness the Prince Philip round South America early next year.

Intrigued by this situation, our observer might then turn to the successful effort by the Ministry of Aviation to bring the five helicopter manufacturers together. He would note that the most recent step by the helicopter group had been to acquire the licence for the American design favoured by one State airline. He would seek in vain for any news of orders for the Rotodyne which when in the hands of the firm which designed and developed it two or three years back was without a peer in the whole field of rotary-wing flight.

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A Happy Christmas and a Prosperous New Year to our Readers throughout the World

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Matters of Moment

More V/STOL Collaboration

FOLLOWING the recent announcement by Hawker Siddeley Aviation that it had joined a six-nation seven-company consortium to cover design and possible production of a VTOL strike fighter to NATO's BMR-3 specification (THE AEROPLANE AND ASTRONAUTICS, Nov. 23, page 660) has come news of another Hawker Siddeley international link—this time concerned with the NATO BMR-4 specification for a V/STOL transport. This new agreement is between Hawker Siddeley Aviation, de Havilland Aircraft of Canada, Bell Aerosystems in America, Avions Fairey of Belgium and Nord Aviation in France.

Within this group there must be an almost unrivalled experience—both in scope and variety—on the design, development and production of military and civil transports—to say nothing of a considerable amount of know-how in VTOL and STOL technology. And, as is also pointed out in the announcement concerning this agreement, the new alliance has a wide and varied experience in international co-operation in the field of production.

No details of the way in which the companies concerned in this agreement will effect their collaboration have so far been made available. In the case of the fighter collaboration agreement, it was said that each member of the consortium would be free to submit designs and that the whole group would share production of the accepted aircraft.

Two-man Mercury Capsule

A NEW, enlarged Mercury spacecraft, to carry two men on long-duration orbital missions, is to be produced under a new NASA programme. Negotiations are taking place with the McDonnell Aircraft Corporation, prime contractor for the original Mercury capsule, for the development and production of a new vehicle of the same basic shape but two to three times heavier. Other features of the project are outlined on page 795 of this issue.

Launching vehicle will be the Titan II, produced by the Martin Marietta Corporation. In conjunction with the new project, it is planned to begin experiments in orbital rendezvous. NASA explains: "Rendezvous in orbit—the operation whereby one spacecraft will be capable of docking with another vehicle in Earth orbit—is one way of carrying out later Project Apollo manned lunar landing missions. Another possibility is the direct-flight approach using a multi-million-pound thrust Nova booster. Both methods will be explored in order to meet a national goal of a manned lunar landing by 1970."

The new Mercury spacecraft's target vehicle will be an Agena rocket stage, produced by the Lockheed Aircraft Corporation, and similar to the vehicles used in the Ranger and Discoverer projects. In carrying out rendezvous operations, the Agena stage will be launched into close-orbit around the Earth by an Atlas booster. Ground tracking stations will determine the optimum launch time for the Titan-boosted spacecraft. Then, with both vehicles in orbit, propulsion in both the Agena and the two-man spacecraft can be used to perform rendezvous and docking manœuvres.

Provisional cost estimates for the programme—including about a dozen spacecraft, Atlas-Agena B and Titan II vehicles—suggest a total expenditure of at least $500 million.

Germany Prepares for the SST

A COMMISSION of four German Ländes, Hamburg, Bremen, Schleswig-Holstein, and Lower Saxony have been looking into plans for a new intercontinental airport in the north of Germany. An area about 20 miles north of the city of Hamburg, near Kaltenkirchen, has been proposed. The site has been selected close to the North Sea so that it will be suitable for supersonic traffic, in order to avoid residential areas which would suffer from the noise.

The new airport will cost between 300 and 500 million D-Marks. Other areas considered by the commission, have been found unsuitable; either they are not near enough to the big cities, or hilly or too close to the Iron Curtain, or would affect other air traffic routes.

The airport at Cologne-Wahn got into trouble with the nearby residents who objected to jet noise, and made vigorous protests. Herr Lauscher, the Minister of Traffic and Economy for North Rhine-Westphalia, promised to look for an area, to which people might be moved out of the noisy zone around the airport. A correspondent states that Wahn is not liked too much by air traffic companies. The number of passengers is much less than experts forecast.

Wuppertal, in the southern Ruhr is looking for an airport for local traffic. Experts have proposed a site near Remscheid.

1961 is expected to have been the hardest year since 1955 for Lufthansa. North Atlantic traffic did not grow as successfully as the management expected. They hope things will get better in 1962, arguing that people need time to get accustomed to new lines.

Lufthansa recently announced a contract with British European Airways for a new freight service, London-Dusseldorf-Frankfurt-London, which is to be started on Jan. 2 next, with the Armstrong Whitworth Argosy. Another contract between Lufthansa and Seaboard World Airlines on North Atlantic freight service has been licensed by the C.A.B. (see page 782).

OUT AT HATFIELD.—Soon after these words are read the new de Havilland Trident—powered by three Rolls-Royce Spey turbojets—should have made its first flight. The Trident is specifically designed for short/medium-range routes and 24 are on order for B.E.A.; services are planned to start by the end of 1963.

SEASONAL SCENE.—Canadair's CL-41 trainer, which has been ordered for the R.C.A.F., is pictured against an appropriate setting among the Swiss Alps during its recent sales tour of Europe.

VTOL Setback

ALTHOUGH it was officially stated that the loss, last week, of the second prototype Hawker P.1127 would not seriously impede development of the type, it must, none the less, have a major effect on the flight test programme. Up to the time of the accident, two of these aircraft had been flying; a third is scheduled to make its first flight in January.

At the time of going to press, no statements had been forthcoming to give any indication as to the cause of the accident. The aircraft was being flown by Hawker's chief test pilot, A. W. Bedford, on a routine test flight from Dunsfold. This test was related to normal level flight conditions and was not, in any way, concerned with the VTOL regime; in point of fact, we understand that this particular prototype had not made any VTOL flights and was engaged solely in level-flight research.

According to reports, the aircraft was at about 8,000 ft. when the pilot reported that the powerplant was not functioning properly. Because of this he decided to land at Yeovilton and was on a final approach when he was forced to use his ejector seat. By that time, he had brought the aircraft down to about 200 ft. and was within a quarter of a mile of the actual runway, on the glide at about 150 to 200 kts.

The wreckage is now being examined and a full-scale inquiry is to be held. As is usual in these cases, a number of conflicting reports and suggestions have been made from various sources. So far none of these has helped to make it possible for even a guess at the likely cause to be made. Certainly there is nothing in them that makes a case for suggesting that an engine failure was involved or even that the engine, as such, was in any way to blame.

Hot-weather Wessex

TROPICAL trials with Westland Wessex HAS.1 XM330 from the A. and A.E.E., Boscombe Down, have been completed. At Le Bourget du Lac, a French A.F.B. on the Franco-Swiss border, take-off, hovering and handling trials at altitude were made. At Hal Far, Malta, the Wessex operated in the anti-submarine rôle, both by day and night, and at Idris, Libya, undertook missions similar to those which the Wessex HC.2 for the R.A.F. will be called upon to perform.

In all the machine completed 127 hr. flying time, including the outward and return flights. Of this the automatic pilot was in use for 126 hr. Only one starting failure—due to a faulty cartridge—was experienced.

Extended Radar Coverage for Italy

THERE will be a significant increase in the radar coverage over Italy following the bringing into operation, during the coming six weeks, of surveillance radar within the Milan F.I.R. The Rome terminal area has provided radar control of civil traffic for some 16 months with considerable success; Brindisi, Italy's third F.I.R., has no control radar, and is unlikely to have it.

Milan's traffic (3,697 movements during September) is only about half that of Rome, but it is, nevertheless, both considerable and increasing, and the area has more complex weather problems. Linate Airport has been chosen for the siting of radar because it has a greater share of traffic than Malpensa.

Operational trials of the radar start this week and service will be initiated in stages immediately the trials are complete. Although limited in range, the equipment will satisfactorily cover most of the terminal area, bounded by the NDBs at Monteceneri, Parla, Genoa and Turin. The proximity of the Alps, with the consequent need for the use of moving target indication (MTI) over the whole distance, reduces the effective range to about 55 miles.

The radar services will be provided to all incoming IFR traffic up to flight level 250 and also to en route traffic in case of confliction. No service will be provided to departing traffic. The radar controller will operate on the same frequency as the central sector terminal controller, thus ensuring complete liaison and information exchange between procedural and radar control. The radar will also operate on the Linate approach frequency, so it will have the capacity to position aircraft accurately on final approach; there will be a similar facility for Malpensa, but with lessened accuracy.

The service will be introduced in phases and will be fully operational by the end of January. Three experienced radar controllers from Rome A.C.C. will be posted to Linate to initiate the service and to train local controllers. Procedures and organization will be closely patterned on Rome radar. It is also reported that Telefunken PAR is to be installed at Linate during next year.

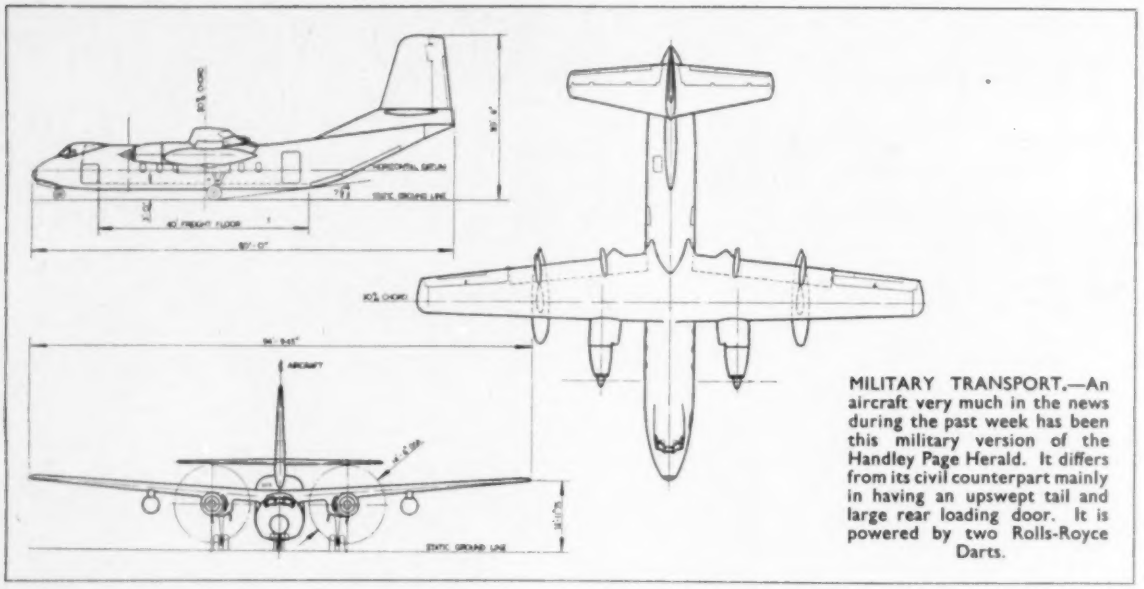
The Future of E.T.P.S.

MANNED aircraft, it is clear, will be with us militarily for much longer than might have been thought from the infamous 1957 White Paper. The requirement for test pilots is therefore likely to increase, rather than diminish, and the future of their fine training centre at Farnborough—the Empire Test Pilot's School—now seems more assured.

E.T.P.S. operates a miscellany of aircraft, ranging from Hunters to Hastings, and also including Canberras, Devons, Meteors, Vampires, Chipmunks, Provosts and gliders, to give its students experience of the widest possible range of types during their course. This is of a year's duration, and attracts members from Commonwealth, NATO and foreign air forces, although primarily intended to meet the demands of the British Services and industry.

Some rearrangement has been taking place among the aircraft fleet of E.T.P.S., which comprises about 16 different types, including two Dragonfly helicopters. The School's Swift has been retired, along with the rest of this type in R.A.F. service, but the four-engined fleet, currently represented by the Hastings and a Shackleton, is to be supplemented by the time of the next course, in the New Year, by a couple of Viscount 700s. These will enable more representative handling experience to be gained on multi-turboprop aircraft, since the School is probably losing its Gannet.

This will be the first course under the new Commandant, Gp. Capt. R. A. Watts, A.F.C., who took over this post on Dec. 15 from Capt. K. R. Hickson, R.N. At the recent annual McKenna Dinner marking the completion of No. 20 Course and the end of his term as Commandant, Capt. Hickson introduced



MILITARY TRANSPORT.—An aircraft very much in the news during the past week has been this military version of the Handley Page Herald. It differs from its civil counterpart mainly in having an upswept tail and large rear loading door. It is powered by two Rolls-Royce Darts.

Matters of Moment . . . .

Rear Admiral Noel Gaylor, U.S.N., and Sir Sydney Camm as guests of honour. He mentioned the long association of the Admiral with test flying, while adding that even the students would be aware of Sir Sydney's association with aircraft for many years.

Admiral Gaylor presented, on behalf of Admiral P. H. Ramsey, commander of the Patuxent River Naval Air Test Center, a new trophy, the Patuxent Shield, for the second highest student on the course. Its first recipient was Flt. Lt. J. E. C. Mayes, who was a very close second to this year's McKenna Trophy winner, Flt. Lt. C. C. Rustin. The Edwards Trophy, for the student making the most progress, went to Flt. Lt. P. J. Farris, while Sir Sydney Camm presented the Hunter Trophy to Lieut. H. W. A. Deacon, R.N., for the best preview handling report.

For once, it was an all-British occasion where awards were concerned. And it was interesting to hear Capt. Hickson report that the course as a whole was above average. J.E.F.

Aeronautics at Imperial College

RESEARCH and experimental work done in the department of aeronautics at Imperial College, during the past year has ranged over a number of the newer technologies. Most of these, it seems from the College's annual report published last week, have been concerned with astronautics and re-entry problems—although more orthodox aeronautics has not been neglected.

It is disclosed, for example, that the department's new plasma-jet tunnel is now installed and has an initial test programme covering physical measurements in the test jet, ablation studies, and an investigation of methods of reducing heat transfer rates by transpiration cooling.

A three-component balance has been added to the hypersonic tunnel and preliminary calibration of the tunnel in its latest form is now being done. The study of separated flow phenomena, the report states, is continuing and soon work on separated flows involving heat transfer will be started. In the College's 8-in. by 2½-in. supersonic tunnel, too, a study is being made of the problem of flow separation with heat transfer across the separation region. The larger scale of this apparatus will permit a pressure and velocity distribution survey to be made within the separated flow region.

Among a number of theoretical studies that have been made, is one concerning the supersonic wave-drag of various wing/body combinations. The flow past a triangular wing with a sonic velocity component normal to the leading-edge has also been studied, as has the inviscid shear flow past bodies.

Four principal areas of work are being covered in the aeronautical structures section. The first of these is concerned with a fuselage test specimen—12 ft. long and having a non-circular cross-section of 4 ft. average diameter—which has an aluminium foil honeycomb sandwich skin and fully glued joints. After the preliminary tests on this specimen are completed the programme is to be developed by having major and minor cut-outs in the skin representing windows and doors extending over a number of bays.

This programme is said to be on a fairly ambitious scale and is planned to enable a check to be made of parallel theoretical studies. This, it is hoped, will contribute "to the elucidation of a number of complicated aspects arising in aeronautical structures."

Two structural component problems are being studied experimentally and theoretically. The first is related to a twisted panel and is intended to determine the effective shear stiffness and the buckling and post-buckling behaviour of such specimens "which often occur in aeronautical practice." The second study concerns the buckling and subsequent failure of sandwich panels under compression.

The fourth set of studies in the structures section is related to the kinetic heating of thin wings. This work has now been extended to include low aspect ratio wings.

Dowty in India

LAST month a senior five-man mission from the Dowty Group made a 12-day tour of India to explore current and future trade prospects with the Republic. Headed by Mr. R. F. Hunt, the Group's deputy chairman, the team met leading members of the Indian Government, and of the military and civil aviation industry.

Planning the trip to coincide with the Anglo-Indian trade exhibition in New Delhi, the Dowty team's itinerary included a tour of the Hindustan Aircraft factory at Bangalore, where they saw the prototype HF-24 supersonic jet fighter, and a visit to the Indian Air Force factory at Kanpur. Known as the Aircraft Manufacturing Depot and controlled by the Maintenance Command of the I.A.F., this unit recently completed its first Indian-built Avro 748 which made its maiden flight on Nov. 1.

Dowty have had a reasonable amount of aircraft business with India for some years and all British aircraft there carry a number of the company's components. In the past two or three years direct and indirect aviation exports have amounted to several millions of pounds, and during its recent visit the Dowty team obtained a firm contract for equipment for the HF-24.

The prototype HF-24, powered by a Bristol Siddeley Orpheus, made its first flight on June 24 and the second aircraft is now nearing completion at Bangalore. Dowty's contribution to this fighter comprises the nose wheel undercarriage, including an extending nosewheel leg to rotate the aircraft to its optimum angle of attack before take-off, the hydraulic system and some of the powered flying controls. Over a period of time Dowty intend to help the Indian aircraft industry get into local production with such components and four Indian technical apprentices are now undergoing training at Cheltenham.

It seems clear that if British companies are not willing to help the Indians in this way, there are a number of foreign concerns, including French and American manufacturers, who will step in and take their place in this growing aviation industry.

New Engineering Facilities at Dublin

BUILT specially for the maintenance and servicing of Aerlinte Boeing 720s, which could not be accommodated in any of the existing buildings at Dublin Airport, a new engineering hangar is now in service at Collinstown. Last week it was formally inspected for the first time by a distinguished party of guests which included the Irish Minister for Transport and Power, Mr. Erskine Childers; Dr. Beere, the Secretary of the Department; and Mr. R. C. O'Connor, Principal of the Civil Aviation Branch. They were escorted by Mr. P. Lynch, chairman of Aerlinte and Aer Lingus and Mr. J. F. Dempsey, the general manager.

The internal width of the new hangar is 180 ft. and it is 150 ft. deep. A 35-ft. clearance height is available over the inner 100 ft. but in the outer 50 ft. there is 10 ft. more headroom. The door opening is 150 ft.

Initial plans for this new building really date back to 1959, when Aerlinte decided to buy three Boeing 720s and in consequence found it necessary to undertake a complete review of maintenance and overhaul operations at Dublin. Quite apart from the covered maintenance area problems involved with the new equipment, there was also the problem of added workshop and stores area. The specialist workshop space available at that time was not adequate to handle Boeing accessories as well as those for the Aer Lingus Viscount, Friendship and DC-3 fleets.

It was, then, decided to build a new hangar near the existing Number Two hangar, and to construct a new workshop block linking the two and capable of extension as required. Work began in February, 1960, and was completed just in time for the doors to be opened on Nov. 17, 1960—the evening of the delivery flight of the airline's first Boeing 720 from New York.

The workshops were occupied progressively from that date with transfer of existing equipment from the previous workshops spread over several months. Normal overhaul and maintenance activities on the company's fleets continued throughout the entire period.

Between the new hangar and the existing one used for Viscount and Friendship overhauls there is an aircraft wash-bay. This is of similar dimensions to the main Boeing hangar and can, if necessary, be converted into an aircraft hangar at a later stage.

The new maintenance building is basically a steel frame structure with a curtain walling of aluminium, glass and steel; masonry filling was only used where absolutely essential. Particular attention has been paid in the design of the building to provision of specialized services such as electrical power, compressed air, heating, ventilation, air conditioning and waste removal. Most of these have been ducted throughout the building so that tappings are available where necessary. The internal partitioning is also designed for quick relocation so that any future extensions or changes can be quickly undertaken.

Only 18 months elapsed from the start of the initial design to completion of the major part of this complex building. It now houses what is thought to be the largest single collection of varied engineering equipment and specialist skills in Ireland. In it, more than 500 skilled staff in some 15 trades carry out maintenance and overhaul work on a wide range of aircraft equipment. This includes powerplants, electrical components, instruments, radio, radar, navigational equipment, sheet metal work, hydraulic and pneumatic components, furnishings, galleys and seats.

B.A.C. Executive

ON Jan. 1 Sir George Edwards, managing director of the British Aircraft Corporation, becomes chairman of the Corporation's four major operating subsidiaries. His appointments as chairman of Bristol Aircraft, Ltd., English Electric Aviation, Ltd., and Vickers-Armstrongs (Aircraft), Ltd., were announced on Tuesday. Sir George already heads the board of Hunting Aircraft, Ltd.

The retiring chairmen—Sir Reginald Verdon Smith, the Hon. H. G. Nelson and Maj.-Gen. Sir Charles Dunphie—also retire from the boards of their respective companies but remain directors of B.A.C. The Hon. H. G. Nelson and Sir Charles Dunphie are deputy chairmen of the Corporation.

Also announced by B.A.C. is the appointment of Mr. J. F. Harper as managing director of Bristol Aircraft, Ltd. He was previously general manager and became a member of the board in March, 1960.

Minuteman Becomes Immobile

THE success of the Polaris FBM and its nuclear submarine carrier has been largely responsible for the abandonment of the project to operate Minuteman ICBMs from railway flatcars, it is learnt from Washington.

Although some $100m. (over £35m.) has been spent on the mobile programme to date, the high cost of storing and maintaining the missile launchers on the U.S. railway networks is apparently no longer considered justified in view of the wide dispersion that is now becoming available with Polaris-launching submarines.

This does not mean that the Minuteman programme is being cut back. On the contrary, the decision to eliminate the mobile launcher will mean that more missiles will be used in fixed underground sites; one report suggests that as many as 900 Minuteman ICBMs may eventually be deployed in various parts of the United States.

Turbine Omniplane

HAVING completed a wind-tunnel programme at the Ames Research Center, the Vanguard Model 2C fan-in-wing VTOL aircraft has now been re-engined with a Lycoming YT-53-L-1 shaft turbine and redesignated Model 2D. Following this turbine installation, the craft was subjected to a tethered-test programme, the results of which are reported to have been most satisfactory. The Model 2D has now been returned to the Ames wind-tunnel for a new test programme, still financed by the U.S.A.F. Air Research and Development Command.

For this new version, supplementary hovering lift and pitch control was provided. This is achieved with a third horizontal ducted fan situated in the nose section of the fuselage. The Model 2D also has top and bottom closures for conversion of the fuselage nose to a conventional arrangement for forward flight. This system, developed by Vanguard, was added solely to obtain data from wind-tunnel tests for its proprietary use on subsequent Vanguard aircraft.

The Vanguard Model 2D is a two-seat low-wing monoplane with a single shaft-turbine engine housed in the fuselage and driving all the propulsive and lifting rotors through an interconnecting transmission system. A ducted pusher propeller in the tail provides the thrust required for forward flight.

For hovering and transition flight, the craft derives its lift from two horizontal ducted rotors, laterally disposed inside a low aspect ratio wing. Closures on top and bottom of the ducts convert the surfaces into conventional wings for high-speed flight when the rotors are fully enclosed and inoperative. Tail surfaces are mounted in the airstream from the ducted tail propeller to provide pitch and yaw control during hovering as well as in forward flight. Full-span 20% chord "flaperons" are also used for low-speed control.—HOWARD LEVY.

[News of another fan-in-wing project—that under development by General Electric/Ryan—is on page 791.—ED.]

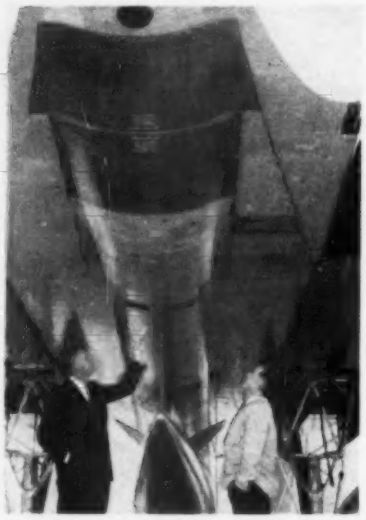
WATTISHAM GUEST.—King Hussein of Jordan paid a visit to R.A.F. Wattisham last Friday. During his stay he made a 40-min. sortie in the back seat of a Javelin T.3. Here, His Majesty is about to inspect the guard of honour; on his right is Flt. Lt. L. Marsh, guard commander, and behind him Gp. Capt. B. P. T. Horsley, O.C. Wattisham and Wg. Cdr. E. P. Bennett, Air Adviser of the Royal Jordanian Air Force.

Aviation News in General

POWER FOR THE HF-24. — A decision as to whether Bristol Siddeley Orpheus B Or 12 or Klimov VK-7 turbojets will power the Mk. 2 version of the Hindustan HF-24 is to be delayed, reports our Indian correspondent, until trials have been made with the Russian engine. Six have been purchased for this purpose. Russia has offered full manufacturing rights if this engine should be selected.

SST TARGET.—First flight of the American supersonic transport prototype is planned in 1967, according to the F.A.A. A contractor will be chosen by 1963 and construction started in 1964. Development of the prototype is expected to cost up to £180 million.

RECORD ATTEMPT.—April 16, 1962, has been named as the day when racing motorist Ron Flockhart will begin his second Sydney-London point-to-point record attempt. He will again be flying an ex-R.A.A.F. Merlin-powered P-51 Mustang. Refuelling stops en route are planned for Darwin, Singapore, Madras, Karachi (if necessary), Bahrain and Athens. At these points the aircraft will be handled by Air India. The existing Sydney-London record of 130 hr., set up by A. E. Clouston and Victor Ricketts in a D.H.88 Comet, has stood since 1938. Flockhart hopes to complete the 12,000-mile flight in about 75 hr.



HUSTLER DEFENCE.—Part of the defensive electronic counter-measures (DECM) system of the Convair B-58 Hustler is covered by this non-magnetic radome in the belly of the aircraft. Developed by Sylvania Electronics Systems, the DECM equipment it stated to make the bomber "almost invisible to enemy radar."

YEOVIL HAND-OVER.—The first two of six Gnome-powered Whirlwind 3s for the Ghana Air Force were handed over on Dec. 14 by Mr. E. C. Wheeldon, Westland Aircraft deputy chairman and managing director, Mr. K. Addae from the Ghana High Commission in London accepted the aircraft. One of the two machines is fitted out to de luxe standards for use as a V.I.P. transport.

MIRAGE FOR SOUTH AFRICA?—According to the *Rand Daily Mail* the South African Air Force has ordered 16 Dassault Mirage IIIs and taken an option on a similar number.

MIRAGE VERSIONS.—Second prototype of the Mirage IIIR has been completed at Melun-Villaroche. The first of these camera-equipped variants is at Istres. The Mirage IIIE, in its production form with an Atar 9C engine, carries a small radome under the nose forward of the wheel well, and is equipped for low altitude intruding as well as interception.

BELL ORDERS.—A contract for 274 Bell HU-1B and eight HU-1D helicopters has been placed by the U.S.A.F. on behalf of the U.S. Army. It is worth over $53 million, and ensures production of the Iroquois until November, 1963.

INDIAN FIRST.—The first Indian turbojet to be built entirely from nationally produced components, a Bristol Siddeley Orpheus 701, has completed a 96-hr. quality approval test. The Orpheus is built under licence by Hindustan Aircraft, as is the Folland Gnat which this engine powers.

MANNED MERCURY.—Launch date for the three-orbit mission of Lt.-Col. John Glenn in the Mercury MA-6 capsule is tentatively scheduled for Jan. 16.

WEATHER SENTINEL.—Following the participation of Soviet meteorological experts in the U.S.-sponsored International Meteorological Satellite Workshop, it is understood that the Soviet Union intends to launch a weather satellite. The United States has offered to make American meteorological satellites available to the United Nations.

RE-ENTRY. — The re-entry capsule from Discoverer XXXVI was recovered from the sea near Hawaii on Dec. 17.

NATO SSM.—According to American reports, the English Electric Blue Water tactical SSM of 85 miles range is considered more likely to win NATO approval than the U.S. Sergeant designed to the same specification. The belief is said to be "partly reflected" in the reluctance of the Defence Department to approve more funds for Sergeant in the fiscal year 1963 budget.

NEEDLES PLOT.—Three sightings of what appears to be the West Ford package, containing 350 million hair-like copper dipoles, have been reported by the Lincoln Laboratories Millstone Hill Radar Station, West Ford, Mass. The package was ejected from the Midas IV satellite launched on Oct. 21.

SPACE WOMAN?—Lt.-Gen. N. P. Kamanin, accompanying Major Yuri Gagarin on his Indian tour, was quoted as saying on Nov. 6 that Russia "planned to send a woman into space in the not too distant future." He said that Russia had not so far launched another spacecraft because data from Major Gagarin's and Major Titov's flights were still being analysed. The next Soviet spaceship "would carry more than one man."

(*Continued on page 797*).

Commercial Aviation Affairs

ATL-98 PROGRESS.—Development flying with the ATL-98 Carvair was completed early this month and the prototype is now in the shops for interior fitting and furnishing.

DC-8 ORDER.—Trans Caribbean Airways has ordered a second Douglas DC-8, for delivery next summer. The first went into service last month between New York and Puerto Rico.

CARAVELLE DEAL.—Deadline for completion of the deal between T.W.A. and Sud Aviation for the purchase of 20 Caravelles has again been extended. The original November deadline had previously been postponed to Dec. 17. T.W.A. planned to finance the $100 million deal by a public stock issue but the poor state of the stock market has proved an obstacle (see our issue for Dec. 7).

HELP FOR T.A.P.—A 40% interest in the Portuguese airline T.A.P. is to be purchased by the merged T.A.I./U.A.T. company. Aircraft owned by the French company will be leased to T.A.P. which may also buy three Caravelles.

AVIANCA'S 720Bs.—On Nov. 24 Avianca began operations on the Bogota-U.S. run with its own Boeing 720Bs. On Jan. 16 they will be introduced on the mid-Atlantic route to Madrid, Paris and Frankfurt. Commercial and pooling arrangements have been agreed with Air France on this route.

C.P.A. SUPERS.—First of Canadian Pacific Airlines' Super DC-8s, *Empress of Montreal*, made a transcontinental flight from Vancouver via Winnipeg and Toronto to Montreal on Dec. 3. This aeroplane is the DC-8 which "went supersonic" in August and recently flew from Vancouver to Tokyo in a record 10 hr. 13 min. All C.P.A. DC-8s are being returned to Douglas for conversion to the Super configuration with 4% wing leading edge extension.

GATWICK CUT.—B.E.A. and Air France will discontinue next year their limited use of Gatwick for London-Paris services. Poor loads on this route last summer has been given by B.E.A. as the reason for the change.

NORTH STAR DISPOSAL.—T.C.A. has now sold all 21 Canadair North Stars which had been in service since May, 1948. Four have gone to World Wide Airways in Montreal, one to International Air Freighters of Edmonton, five to LAUSA in Mexico City and 11 to Alfred John Gaul in London. The latter were originally to be used by Overseas Aviation and are now being advertised by Keegan Aviation.

IRISH TALKS FAIL.—No agreement was reached in 10 days of discussions between U.S. and Irish delegations on the American wish to obtain terminal and "beyond" rights at Dublin (see our issue of Dec. 7, p. 716). Proposals made by the U.S. delegation will be considered by the Irish Government and new talks may be held next year.

AIRLINE LOSSES.—A net loss of $30 million, after taxation and interest payment, is expected to be shown by the U.S. domestic trunk airlines for 1961. It will be the first time the airlines have shown a deficit as a group since 1948. The Air Transport Association estimates that 1961 revenues increased by 4% and operating expenses by 6%. Passenger-miles increased by only about 1%.

B.O.A.C. AND M.E.A. POOL.—B.O.A.C. and Middle East Airlines have renewed their existing pool agreement on common routes between London and Beirut and London and the Gulf area. The agreement has been extended for 12 months and the companies will continue to co-operate in developing traffic on these routes.

AID FOR NORTHEAST. — The C.A.B. order permitting Hughes Tool Co. to offer emergency financial aid to Northeast Airlines came into effect on Dec. 13 (see our previous issue). Eastern and National, Northeast's principal competitor on the Florida routes, asked the U.S. Court of Appeals to set aside the C.A.B. decision as illegal, but this appeal was rejected on Dec. 12. Up to our Press deadline, no details were available of the aid Hughes would offer Northeast.

BRANIFF REFUSED AGAIN.—A request to the C.A.B. for a subsidy for South American operations by Braniff Airways has been dismissed for the second time. Braniff first requested $3.1 million and, when asked for more detailed economic justification, gave data and asked for $3.7 million (see our issue of Dec. 7, p. 717).

P.A.A. N.Y.-JAMAICA?—A C.A.B. examiner has recommended that Pan American be awarded the non-stop New York-Jamaica route, at present flown by B.O.A.C. and Avianca. Delta, Eastern, National, Trans Caribbean and Braniff also had applied for the route.

CUT-RATE CUT-OUT. — Flying Tigers' proposed reduced rates on selected commodities moving from west to east across the U.S. have been suspended by the C.A.B. for investigation because they "undercut all competition" and "sufficient support" for the reduction is absent. Average rate proposed by Tigers was only 9.5 cents per short ton-mile.

ANTIGUA SERVICE.—B.W.I.A. will be given authority to operate an Antigua-New York service until October, 1962, if the recommendation of a C.A.B. examiner is accepted.

LOW FARES DROPPED. — The C.A.B. has suspended economy-class and excursion fares on transcontinental U.S. routes. T.W.A. has been operating such fares since the autumn.

FARES UP.—Aer Lingus has increased its fares (other than domestic) by about 5%. The higher landing fees at British airports are said to be partly responsible.

CHARTER NEWCOMER. — With three ex-El Al Constellations, a new British charter company plans to begin operations on March 1, 1962, with the name Euravia (London), Ltd. The company's offices are temporarily at 25 Blackstone Road, N.W.2.

NEW NAME.—Itavia, the Italian domestic airline which plans to restart operations next year with DC-3s (see our issue of Nov. 2, p. 565) has changed its name to Aerolinee Itavia—or ALI for short.

SAM SERVICE. — Societa Aerea Mediterranea has taken over Alitalia's responsibilities to operate a Venice-Trieste service, at a frequency of six flights weekly. Aircraft used are DC-3s formerly belonging to Alitalia.

CANADIAN TRAFFIC DROPS.—Fewer passengers, less freight and lower profits for Canadian airlines in the month of July are reported by the Dominion Bureau of Statistics. Passengers decreased to 477,901 from 488,897; freight dropped to 23,354,147 lb. from 24,031,317 lb.; and profits fell to $2,602,100 from $2,750,000.

LOOKING UP?—Pan American has recorded its heaviest traffic for any October, with increases on nearly all sectors and a total of 489,694,000 passenger-miles. North Atlantic traffic was up 30%, with a total of 218,652,000 passenger-miles.

(*Continued on page 797*)

ANTONOV TRIO. — External differences between the prototype An-24 and subsequent aircraft can be seen in this newly released photograph. Compared with the aircraft at the top of the echelon the other two each have a ventral fin, dorsal fin of increased area and longer engine nacelles.

News About People

AIR TRAFFIC APPOINTMENT.—A serving R.A.F. officer, Air Cdre. H. J. Hickey, has been appointed Assistant Controller of Air Traffic Services by the M.o.A. Air Cdre. Hickey is at present A.O.C. R.A.F. United Kingdom Air Traffic Services, a position he will hand over to Air Cdre. J. M. Thompson.

SCOTTISH APPOINTMENT. — Mr. Ritchie Campbell, M.I.C.E., has been appointed to the Scottish Advisory Committee for Civil Aviation, in succession to Mr. J. C. Lang, O.B.E., who died earlier this year. Mr. Campbell is a consultant engineer and member of the Glasgow firm of Babtie, Shaw and Morton. He was a member of the former Scottish Aerodromes Board.

X-15 AWARD.—President Kennedy has presented the 1961 Harmon International Aviator's Trophy to the three pilots who pioneered in flying the X-15 research aircraft. At ceremonies at the White House on Nov. 28, test pilots A. Scott Crossfield of North American Aviation, Joseph A. Walker of NASA, and Maj. Robert M. White of the U.S.A.F., received the awards.

I.A.S. PRESIDENT.—The president of the Lockheed Missiles and Space Co., L. Eugene Root, has been elected president of the Institute of the Aerospace Sciences for 1962.

COMMUNICATIONS CHAIRMAN.—On Jan. 1 Sir John Macpherson becomes chairman of Cable and Wireless, Ltd., and its associated companies in succession to the late Sir Godfrey Ince.

PERSONNEL INTEREST. — Mr. G. E. P. Checketts, formerly with Bristol Aircraft, Ltd., has been appointed personnel manager by Hunting Aircraft, Ltd.

SKYWAYS APPOINTMENT.—Mr. H. R. O. Stephens has been appointed traffic manager to Skyways. He was already acting as representative for Skyways at IATA conferences and meetings in his former capacity of IATA and Interline Manager.

MAN-POWERED POWER.—Herb Elliott, World record holder for the mile, is to "power" the Southampton University Group's man-powered aircraft. Mr. Elliott, a member of the Cambridge University Air Squadron, has more than 100 flying hours to his credit.

MAJOR COOPER.—We regret to record the death, in Falmouth, at the age of 79, of Major James Percy Carre Cooper, M.C., who was Air Ministry Inspector of Accidents from 1924 until Dec. 1, 1937. His many investigations included that of the R101 airship. He had previously served in the R.F.C. and R.A.F. and qualified as a pilot in 1915.

Air Transport

Agreement at Bermuda

OFFICIAL confirmation is awaited of reports from Bermuda that agreement has been reached on new air fares on the North Atlantic (see our previous issue). Reliable sources indicated that two new fares have been proposed by the eight-airline working party at Bermuda. The proposals will be submitted to other IATA members for a mail vote.

As we reported last week, the new fares are a year-round, 21-day excursion (at the same rate as the 17-day off-peak excursion introduced last October); and a special low fare for groups of more than 25 passengers travelling by scheduled airline. The existing excursion fare between London and New York is $350 (£125) return by turbojet and $320 (£114) by turboprop in standard economy-class seating. The proposed group fare is $300 (£107) per passenger.

Airlines involved in the Bermuda talks were: Air India, B.O.A.C., K.L.M., Lufthansa, Pan American, S.A.S., T.C.A. and T.W.A.

Lufthansa Air Freight Development

LUFTHANSA has contracted with Seaboard World Airlines to purchase 120,000 lb. of freight capacity per week each way between New York and Frankfurt. C.A.B. approval has been obtained for the scheme—first reported in our issue for Oct. 26—subject to certain restrictions.

The capacity is being provided by Seaboard at the rate of 20,000 lb. per flight on Canadair CL-44s, of which the airline now has three in service and two on order. Lufthansa will pay $4,300 plus a $100 loading charge for this space on a one-way flight, whether it is taken up or not. This is equivalent to a rate of 21.5 cents per lb. or 11.7 cents per available ton-mile. Additional space can be purchased by Lufthansa at the same rate.

Lufthansa will be wholly responsible for selling the space, and for moving cargo to and from aircraft at origin and destination. The flight itself must be wholly a Seaboard operation, however, and the C.A.B. ruling forbids the services to be advertised as being by or on behalf of any other carrier than Seaboard.

The carrying of Lufthansa's name on the aircraft is specifically banned. Lufthansa also will be allowed no control over Seaboard's schedule and will not be permitted to put cargo representatives aboard Seaboard's flights.

The arrangement has been licensed to be immediately effective and to continue until the end of 1962.

Seaboard is at present flying 12 scheduled services a week across the Atlantic linking New York with 19 European cities. Frequency will be reduced to 10 a week in January with the introduction of more CL-44 flights, each of which carries twice as much freight as the Super Constellation. The nine L-1049s will be withdrawn from Atlantic service next January and most will probably be sold.

In another development of its freight services, Lufthansa was to conclude an agreement with B.E.A. this week for joint operation of the Argosy service between London, Frankfurt and Dusseldorf, starting January 2. The service will operate over a triangular route six nights a week and the aircraft will carry the markings of both airlines.

Revenues will be pooled on a 50-50 basis, with Lufthansa paying B.E.A. for use of the aircraft and crews.

Co-operation and Competition for Canada

IN an address last week, Mr. Grant McConachie, president of Canadian Pacific Air Lines, said that he did not believe that a merger of the two major Canadian airlines was either practical or necessary (see last week's issue, p. 756). He described the argument that competition could only mean losses and a burden to the taxpayer as "superficial nonsense."

Mr. McConachie agreed that the airline situation—for the rest of the World as well as for Canada—was, because of the cost of the turbojet transition, a difficult one, but said that the greatest menaces to Canada's air future were those who would deal with temporary financial difficulties by means of a policy of stifling restrictions.

"Actually, the state of the Canadian airline industry," he said, "has been painted in a false shade of red. T.C.A., in particular, is in much better financial health than the public has been led to believe. The image of an airline in a perilous financial state is not fair to T.C.A., nor does it create the proper climate for conceiving the right air policy."

"In the monopoly days," he continued, "the Canadian airline was just about the last in North America to introduce tourist fares and these were at the highest rates. Now, after competition, we have the lowest rates in North America . . . I suggest that this is more than coincidence."

Other points made by the C.P.A. president were that the fleets of turbojet aircraft would lift the major airlines out of the red as quickly as they had dipped into it; that pooling of Canadian and U.K. traffic with B.O.A.C. was a "poor deal" for Canada; that the requirements and prospects of an enlightened air policy justified the establishment of a Canadian Ministry of Civil Aviation; that there were opportunities for co-operation which would be of material benefit to both airlines; and that C.P.A. supported the Government policy that there should not be direct competition between the two carriers on the same international routes.

Earlier in the same day (Dec. 11), at a Press conference, Mr. McConachie had stated that if he had the licences for cargo from London to New York via Montreal, from London to Chicago via Toronto, and for cargo routes on the transcontinental run, he would buy Canadair CL-44s. T.C.A., he said, had these licences and could start in Vienna or Zurich and pick up cargo all the way back to Canada.

Commenting on the speech, Trans-Canada Air Line's president, Mr. Gordon McGregor, said on Dec. 12 that he shared Mr. McConachie's optimism about the future of air transportation in Canada.

"T.C.A. is gratified by Mr. McConachie's confidence in the airline's vigorous good health and his appreciation of our high service standards," said Mr. McGregor. "We share with Mr. McConachie his optimism for the future of Canadian air transportation providing, of course, that such optimism remains alert to current economic problems and is not distorted by the use of rose-coloured glasses.

"We are also pleased to learn of C.P.A.'s support of Canadian Government policy that there should not be direct competition between the two Canadian carriers on the same international routes.

"It was because T.C.A. felt likewise that we opposed C.P.A.'s application for a Vancouver-London service, T.C.A. having operated between those points on the Hudson Bay route since 1958."

Avro Demonstration in Italy

EARLIER this month an Avro 748 was demonstrated to Aviolinee Siciliane (Alis) at Catania. Two demonstration flights were made. On the first the 748 flew with 30 passengers from Catania to Regio Calabria, where it landed on the rough grass field of 1,200 metres (3,950 ft.). After a short stop to permit local authorities to inspect the aircraft, it took off for Boccadifalco, Palermo's old airport, where it landed on the 1,200-metre runway with a downhill slope. Two hours were spent on the ground at Boccadifalco to enable Palermo authorities to see the aircraft and watch demonstrations of the aircraft's short take-off and landing and single-engine performance.

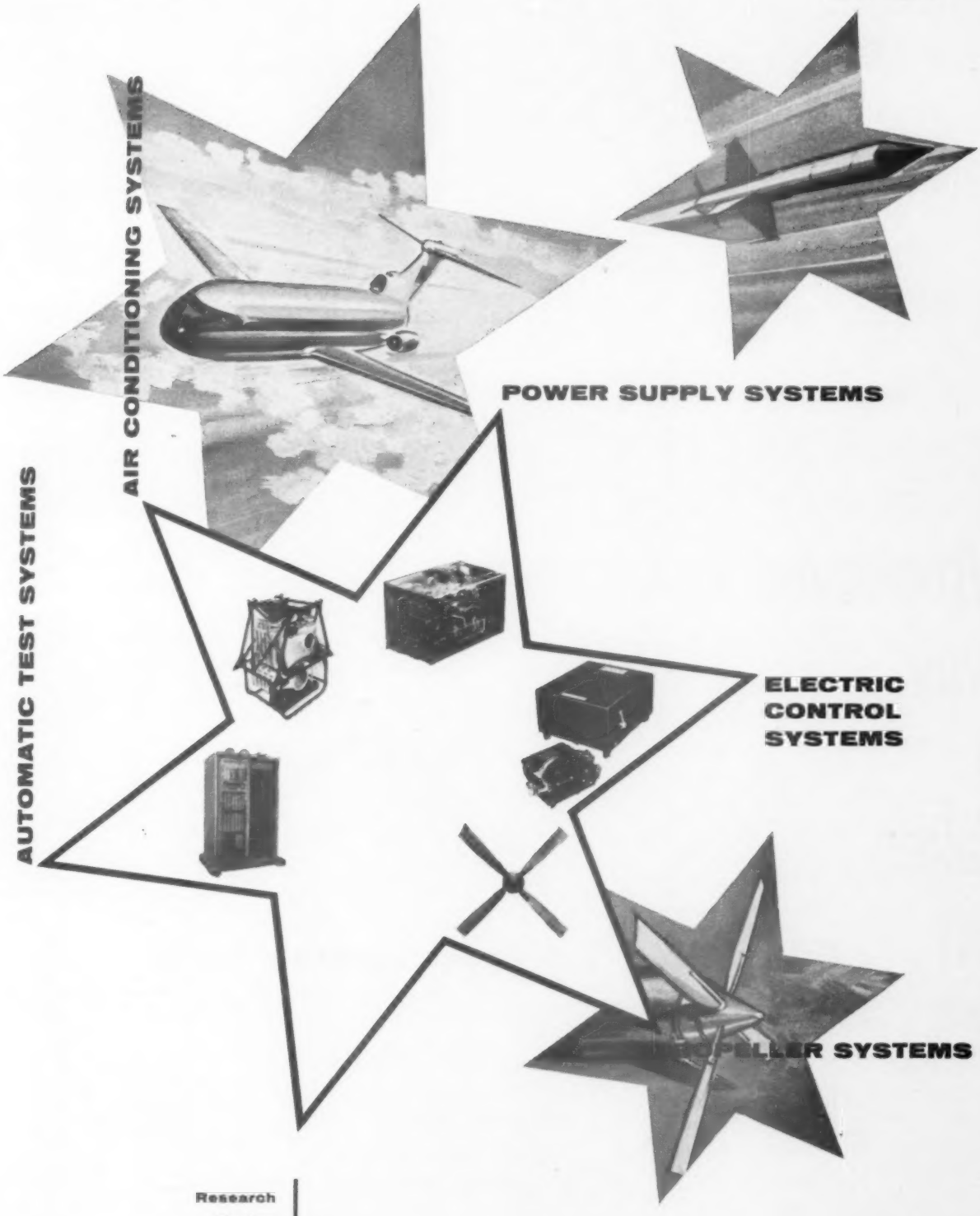
The Avro 748 then returned to Catania, overflying snow-covered Etna en route to give passengers a view of the erupting crater. Later in the day a technical demonstration flight was given with Alis pilots on board to demonstrate engine failure on take-off, stalling characteristics, and to give the pilots an opportunity to handle the aircraft.

Aviolinee Siciliane is a new Italian independent company, at present equipped with three de Havilland Herons (see our issue for Nov. 2). A Handley Page Herald was demonstrated for Alis in November.

Helicopter Subsidy Cut

CUTS in the operations of the three scheduled U.S. helicopter airlines will be approved by the C.A.B. because Congress has reduced the subsidy appropriation for 1962. The C.A.B. had requested $6.9 million for helicopter subsidies but this was cut to $6 million. New York Airways, Los Angeles Airways and Chicago Helicopter Airways have all been asked to file details of the way they will limit their operations.

Cuts in the New York services were approved by the C.A.B. on Dec. 14. The airline previously had indicated it would suspend all operations at the W.30th. Street Heliport, which is now used only for cargo and mail flights. Services to Stamford, White Plains, Bridgeport and Teterboro, which are among the more distant points on the New York network, will also be dropped. The inter-airport network will be retained.



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Air Transport . . . .

All About Australian Civil Aviation

A REPORT on civil aviation in Australia has recently been published by the Minister of State for Civil Aviation. This is the first of its kind, following a requirement in the Air Navigation Act, and is of special value because it includes a great deal of background information which will not be repeated in later editions.

Because of its wide coverage, this 1960-61 report can be considered as a manual of Australian civil aviation policies, regulations, facilities and administration. There are 142 foolscap-sized pages in the report, which includes 37 appendices detailing such matters as air services agreements, traffic results, accident statistics, and expenditure and revenue breakdowns for navigation aids and airports.

National and Continental Plan Merger

A MERGER between National Airlines and Continental Airlines has been proposed by the directors of the companies. A joint announcement by the two chairmen said that a definitive agreement will be drawn up and submitted for final approval by the stockholders and the C.A.B.

Under the plan, the merged company will be known as National-Continental Airlines, Inc. Mr. George Baker, present chairman of National, will continue as chairman, and Mr. Robert F. Six, president of Continental, will become president of the merged company. Mr. Robert E. Wieland, who recently succeeded his uncle, Mr. Baker, as president of National, will become first vice-president and assistant to the chairman.

Shareholders of National will receive 1¼ shares of Continental common stock for each share held.

National Airlines was formed in 1934 as a regional carrier and developed into a trunk operator principally on north-south routes in the eastern U.S. This year, new routes to the west coast were licensed to National.

Continental Airlines also began operations in 1934, as a division of Varney Speed Lines, and is now a major trunk operator flying routes principally to the south and west of Chicago.

Cunard Drops Manchester Flights

NO Cunard Eagle services will be flown from Manchester next year. This decision has been taken by the company because of its failure to obtain approval for a sufficient number of services to make Manchester operations economical.

Cunard Eagle has been operating from Manchester for the past eight years and this year flew services to Hamburg, Copenhagen, Pisa, Rimini, Ostend and Bergen. As the scale of operations was not enough to base aircraft permanently in Manchester, a London-Manchester service is regarded by the company as an essential part of the whole operation. Three applications have been made and rejected for a London-Manchester service, the latest being part of the European and domestic route case before the A.T.L.B. (see our issue for Dec. 7).

The Cunard Eagle decision is to suspend operations from Manchester in 1962. Plans for 1963 depend upon the outcome of B.E.A.'s appeal—and any other appeals—against the recent A.T.L.B. decisions. These will also affect the Manchester-Birmingham-Nice route for which Cunard Eagle has now been licensed, with effect from 1963.

North Atlantic A.T.C. Developments

FOLLOWING the recent installation of the Ferranti Apollo computer at the Oceanic Area Control Centre (O.A.C.), Redbrae, Prestwick, practical experiments in the use of automation to aid the air traffic controller have now started. Undertaken by a special Apollo computer section from the M.o.A. Air Traffic Control Experimental Unit at Heathrow, these trials are designed to gain operational experience in the application of computers to A.T.C. and to improve present control methods in the North Atlantic area.

The Apollo computer system and its capabilities were described in detail in our issue for July 20 this year. The first such installation in the U.K. to be devoted entirely to the problems of A.T.C., it has been incorporated into the North Atlantic control system for three principal reasons:

(i) All essential flight information for the exercise of control at O.A.C. is received and transmitted over teleprinter networks. It is thus already in coded form and probably can be handled eventually under computer control.

(ii) The problems of O.A.C. are difficult and peculiar. They are not so fast-moving and complex as those of Airways control, with its smaller separation standards and the use of radar to assist in extensive climbs and descents, but there are complications which are not encountered in Airways control, and which, therefore, are worthy of special study.

(iii) The installation at Redbrae gives the project a live and direct impetus which would not have been so prominent had the equipment been used in a very broad research/experimental rôle divorced from an operational environment. Experimental work at Redbrae will allow the need for automatic data processing in O.A.C. to be tested and developed in parallel with the present operational system.

In addition to the Apollo computer at Redbrae, better communications facilities to other North Atlantic control centres are now coming into service through ICAO.

Before the end of this year, the laying of two new cables (the CANTAT cable between Scotland and Canada, and the SCOTICE cable between Scotland and Iceland) will provide a continuous high-quality telephone connection between Redbrae and the control centres at Gander, Reykjavik and Shannon. Special "selective-calling" facilities will enable any individual controller at each of these centres to make immediate contact with any selected controller at any of the others.

By the end of 1962 an additional cable (ICECAN, between Iceland and Newfoundland, via Greenland) will strengthen communications by providing an alternative-route safeguard against cable breakdown, and will add an important radio station in Greenland into the common-user telephone circuit. At the same time, a number of telegraph circuits will become available in these same cables, giving a further strengthening of the means for clearing other aeronautical information across the northern Atlantic.

It is hoped that the present LF radio-teleprinter broadcast of met. information operated by the U.K. and Canada may be established as one of the primary ground-to-air services in the North Atlantic area. The M.o.A. has also been experimenting with a high-power VHF transmitter coupled to directional aerials and located at Mangersta on the Isle of Lewis, and has demonstrated that such a two-way air-to-ground link is practicable for use with aircraft up to ranges of 300 and 400 miles from the transmitter.

The application of this type of VHF facility has recently been endorsed by a meeting of states interested in the North Atlantic routes; and an operational station, situated this time on the Isle of Tiree and remotely controlled from Redbrae, is now planned for installation in 1962-63.

EXPERIMENTAL AUTOMATION.—The Ferranti Apollo computer installed at the Oceanic Area Control Centre, Redbrae. This is purely an experimental installation and is unlikely to become operational in its present form.

Air Transport . . . .

France's Four-year Plan

A FOUR-YEAR plan for the development of civil aviation in France is to be debated in the French Parliament shortly. It is estimated for the purpose of this plan that passenger traffic on French airlines and at French airports in 1965 will be double that in 1959, and that freight traffic will grow at a far greater rate.

The plan for 1962-65 has three main objects. The first is to work out a domestic air transport network, not only radiating from Paris to provincial towns, but also connecting regional centres by direct flights. International services from provincial towns will also be developed.

Secondly, the plan covers development of a number of provincial airfields, including those at Marseilles and Nice. Work will begin on the third airport for Paris (see our issue for June 29) which will be needed to go into service in the late 'sixties.

Finally, the plan encompasses further re-equipment of French airlines with jet aircraft. In the period up to 1965, it is estimated that new orders will be placed for 23 long-range jet transports (Boeing 707 or Douglas DC-8), 31 medium-range jets (Caravelles) and a few freighters.

A sum of NF 825 million (about £59 million) is reserved for development of the Super Caravelle SST up to the end of 1965.

The Busy Airports

THE number of passengers handled at U.K. airports in August, 1961, was 22% more than in August, 1960, and was only just short of two million. Air transport movements increased by 14% and freight by 11%.

These statistics give some indication of the recovery in traffic in Europe since the early summer slump. The increase in traffic at London (Heathrow) Airport was, however, below the national average. A study of the following table of selected statistics suggests that most of the increase came from domestic travel, from direct flights to the Continent from provincial airports and from inclusive tour traffic.

AUGUST, 1961

Airport	Total passengers	% change Aug., 1960	Air transport movements	Freight short tons	Mail short tons
London Heathrow	771,224	13	16,554	7,650	1,337
London Gatwick	156,310	69	4,126	769	36
London Stansted	8,704	—	87	2.4	5.2
London Heliport	13	—	8	—	—
Belfast	73,219	21	1,695	302	155
Blackpool	30,246	34	1,042	133	—
Bournemouth	46,781	118	2,704	3,772	—
Bristol	15,289	35	963	59	—
Cardiff	14,930	47	803	36	—
Edinburgh	34,949	19	911	62	—
Ferryfield	62,655	24	6,302	21,528	—
Glasgow	92,103	11	2,680	353	32
Isle of Man	76,856	25	2,231	143	16
Leeds/Bradford	24,825	23	904	25	—
Liverpool	42,804	35	1,553	808	71
Luton	2,088	71	114	6	—
Lympne	23,552	54	836	10	—
Manchester	142,928	24	4,051	7,726	229
Newcastle	31,675	40	967	125	—
Portsmouth	5,784	—	315	—	—
Prestwick	51,058	21	1,304	158	11
Southend	118,018	33	5,937	8,403	—
Stornoway	3,687	40	110	27	4

The U.S. "Non-sked" Scandal Continues

TWO C.A.B. investigations earlier this month fanned the flames of public indignation over U.S. non-scheduled operators (see our issue for Nov. 30, p. 693). Both investigations followed fatal crashes by aircraft on non-scheduled operations. Enough violations of civil air regulations appeared to have occurred for the stories to rate headline treatment in U.S. daily newspapers.

The more serious of the two accidents was that of an Imperial Airlines Constellation on Nov. 8, killing 74 passengers and three of the five-man crew. A public hearing of evidence concerning this accident confirmed what was already known—that the aircraft was making an emergency approach with two engines out on one side and that a third engine was giving trouble shortly before the crash. It remains for the C.A.B.'s official report to indicate in due course why these engines failed and whether any blame is attributable to flight or ground personnel. But irregularities brought to light in the hearing have done nothing to allay public fears about the "non-skeds."

These irregularities included the use of a brush from an automobile to repair a circuit breaker in a fuel pump before the last flight. This brush was too large and was cut down to size. One of the engines which failed was due for overhaul.

After two engines had failed, the crew made one approach to Richmond Airport but were unable to hand-crank the undercarriage down. They apparently did not know, said C.A.B. investigators, that auxiliary hydraulic power could be obtained from the two remaining engines. The aircraft crashed while in the circuit for a second approach. There was also evidence of conflicting orders being given to a student flight engineer by the pilot and co-pilot to open a fuel valve beneath the floor in the passenger compartment.

Evidence was given of an unauthorized passenger having been allowed to travel on the flight deck the day before the accident.

In the second investigation, Golden Gate Airways of San Francisco appealed against an F.A.A. suspension order issued two weeks ago. Golden Gate is the operating name of Far West Airlines and Travis Transportation (see our issue for Nov. 30, p. 707). One of their Beech 18s crashed at Travis Air Force Base on Oct. 18 killing the pilot and six passengers.

The F.A.A. has charged Golden Gate with operating improperly licensed aircraft, falsification of manifests, using low-octane fuel, destroying maintenance records and failing to maintain proper communications. It is also alleged by the F.A.A. that the company was being secretly run by the former president of Arctic Pacific Airlines. When the latter company was closed by the F.A.A. at the end of 1960 for violations discovered after a fatal crash in October, 1960, he had been barred by the F.A.A. from holding a management or supervisory post with any other airline.

Rapid Expansion of Ghana Airways

GHANA AIRWAYS is maintaining a rapid rate of growth in keeping with its status as an instrument of national prestige. Founded three years ago with two Herons and two Dakotas, the airline now serves 19 cities and 15 countries in Africa, Europe and Asia with a fleet of 20 aircraft.

The company's chairman, Mr. James Mercer, was careful to distinguish in a recent speech between "commercial operators" and "national operators." As an example of the latter, Ghana Airways is not expected to show a profit on its balance sheet. It is charged, said Mr. Mercer, with the duty of "carrying the national flag to all parts of Africa and projecting the African personality."

In its first year of operation (1958/59), Ghana Airways carried 22,254 passengers. This figure increased to 51,112 passengers in the year ended June 30, 1961. Comparative freight figures for the same period were 65,029 kg. and 145,099 kg. The air miles flown increased from 664,658 to 2,124,087.

Viscount services were introduced by Ghana Airways on Oct. 27 on the Lagos/Accra route. Two of the three aircraft had then been delivered, and the third is due before the end of the year.

A total of 166 employees of Ghana Airways have to date been assigned to training courses in the U.K. and the U.S.S.R. At the present time 16 pilots and 60 engineers are training in Russia. Fourteen pilots are training in the U.K. and one other is with United Arab Airlines. Also in the U.K. are 45 engineers and 27 stewards.

Commercial Aircraft Data

COMPARATIVE specifications for more than 300 transport aircraft are contained in the International Aeradio Handbook of Aircraft Data*. Since the first edition appeared two years ago, many improvements have been made.

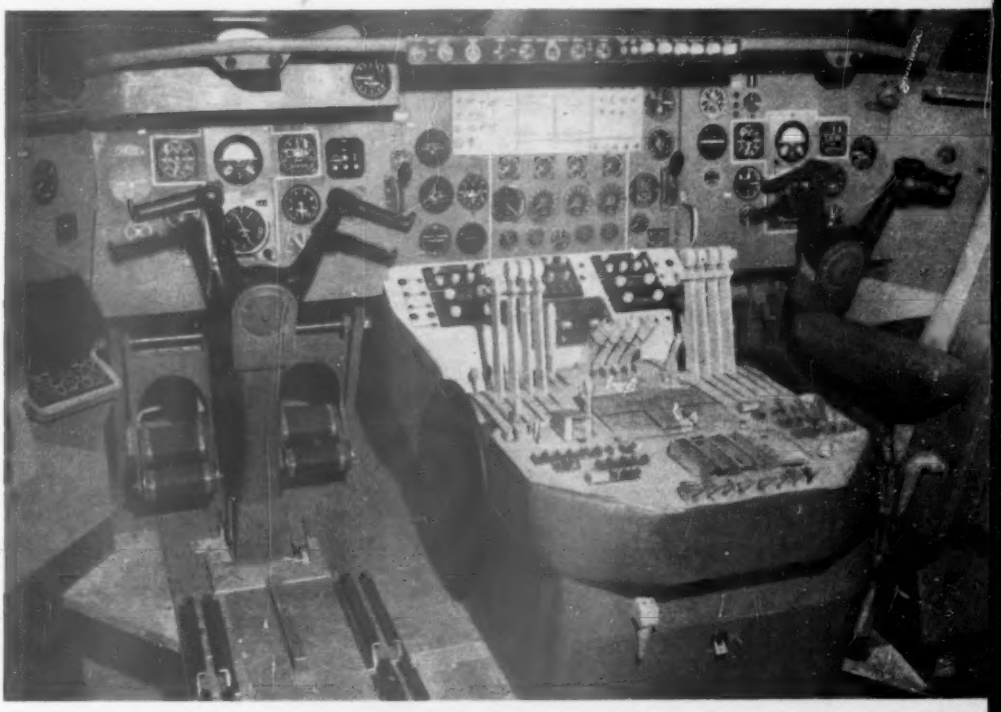
Intended primarily as a working tool for airport authorities, the handbook now includes additional data on landing gear dimensions, tyre pressures and tyre contact areas. Also given are details of the power plant, accommodation, fuel capacity, and type of fuel, primary dimensions, max. gross and landing weights and a summary of performance.

Within the inevitable restrictions of a tabular presentation, the data is precise and reliable, although a few gaps could have been filled without much difficulty—the wheelbase of the DC-8 for example, and data which is missing for some of the older type of aircraft.

The choice of types for inclusion is catholic and extends down to many of the four-seat business aircraft now to be expected at international airports, and back in history to the surviving transports of the inter-War period.

* I.A.L. Handbook of Aircraft Data, 2nd edition, 1961. Compiled and edited by G. R. Stroud. Price 21s. from International Aeradio, 40 Park Street, London, W.1.

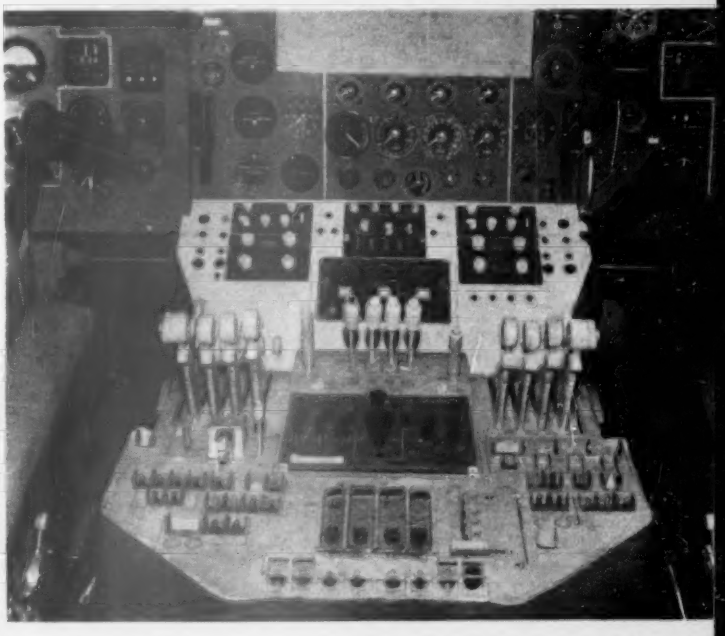
Civil-Military Flight Deck

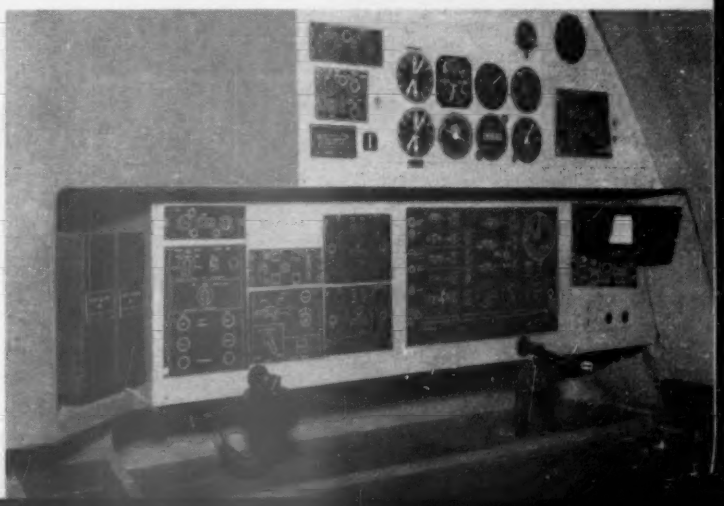


BOTH civil and military requirements have been met in the layout of the Short SC.5 Belfast flight deck. Approved by the Air Registration Board and by the Ministry of Aviation and R.A.F. Transport Command, the layout—details of which can be seen in these photographs of the mock-up—will thus be acceptable without major modifications for civil transport operations.

This mock-up flight deck incorporates the controls associated with the B.L.E.U. Autoland system and includes an application of the Pilot's Electronic Eye-level Presentation (PEEP) system, or "head-up" display, for the captain's position.

Right is the Belfast's central pedestal, which incorporates the control panel for the Autoland system. At the top of the page is a general view of the flight deck. Of special interest are the trim indicators on the coaming and the centralized warning panel below it.





This close-up of the captain's position in the Belfast shows the Rank Cintel PEEP ("head-up" display) screen and the layout of the basic flight-instrument "T." The picture on the right shows the navigator's station.

OPtional Reading—25

LAST week I dealt with the problem of securing an electronic directional signal both accurate and reliable enough to provide the azimuthal input for an all-weather landing autopilot. And by "all weather" I mean *all* weather in which the *aircraft* is capable of landing, bearing in mind its limitations in severe cross-winds or icy runways. Of course, a number of aids will see the aircraft down to limits of 500 ft. and half a mile; unless the automatic equipment is going to cope in fog conditions (say, zero ceiling and 50 yd. R.V.R.), it had better drop the term "all weather"

And, before we move away from the input problem, let it be said quite plainly that the ordinary ILS, as found about the routes today, cannot hope to provide the signal. Here, for example, is a recent report: "On an ILS approach into Calcutta we made contact just prior to intercepting the localizer outbound. I none-the-less continued the approach on instruments down to 300 ft. The other two pilots agree that the centreline of the localizer was offset to the west at all points where we tracked it. On final approach at 300 ft. altitude the on-course position was about 200 ft. to the west (right) of centreline."

So much for the azimuthal guidance. The ILS glide path is worse; and here, unfortunately, there seems little hope of taming it below the 200-ft. mark, wave-guide arrays regardless. So most systems rely on abandoning the glide-path input between 200 and 100 ft. and going over to a radio altimeter signal at or near to the threshold; there is an awkward gap of some seconds between the two. This does not seem to have caused any trouble up till now; the autopilot memorizes the last attitude and maintains this until the radio altimeter signal is picked up. However, in none of the reports which I have read have I seen the length of time which this interval may be in respect of actual glide paths as the pilot may expect to find them on the routes. What, for example, would this interval be at Toronto? Clearly, if it is more than a few seconds and the aircraft is at or near the Flight Manual minimum approach speed (1.3Vs), the question of gusts becomes very important. As readers of OPtional Reading 13-22 may recall, I have a thing about gusts!

However, let us assume that this Scylla is safely past and that the Charybdis of an unserviceable radio altimeter, presumably triplexed, causes no more than a passing qualm (how has it been checked?); we now find ourselves 50 ft. over the threshold with full or nearly full flap and the throttles coming back according to a signal from an airspeed sensor of some sort. Now I would like to know a lot about this sensor. At 50-ft. threshold height the aircraft is already 30 ft. higher than on an average VFR approach; we cannot afford to have it faster too—and before the threshold we cannot afford to have it slower. So we need a very good sensor. Can the airspeed system supply data of the required accuracy?

Here the aircraft is experiencing a rapid change of angle of attack, and it may also be experiencing a change of flap setting; the position error tends to be large and somewhat unstable and before I place my trust in the system I would want to see the figures. Apparently the U.S. Navy, studying the problem from the point of view of carrier landings, also had misgivings; in fact it found the A.S.I. useless and commissioned Specialties Inc. to develop an angle-of-attack indicator so as to provide a reliable aerodynamic input.

The new device is said to have held an experimental F8U Crusader to within 1 kt. of its approach speed; if so, it should do the job all right. But I am afraid that I suspect all straight pitot/static devices as getting by only if they are allowed to carry quite a margin of excess speed so as to avoid critical angles of attack. No doubt readers will correct me if I am wrong here.

I suppose that by now I may have been crossed off several cocktail party lists. However, there are other things to do over Christmas! I have an old apple tree to fell and a second bird table to make so that the tits are not thwarted by the starlings. Come to think of it, how did that bluetit emerge out of the fog and stall right on the lip of the old table?—C.C.J.

Italy and Eurocontrol

FOLLOWING our report on questions and answers in the House of Commons concerning Eurocontrol (THE AEROPLANE AND ASTRONAUTICS, Dec. 7), our Italian correspondent has sent us the following explanation of Italy's position.

Italian civil aviation is controlled by a department of the Air Ministry under the Ministry of Defence—which, in practice, means by the Italian Air Force. The latter provides for civil aviation, inter alia, all personnel and equipment for traffic control including radars, beacons, etc.; furthermore the controllers are paid at Air Force rates of pay. This has been so since the end of the War when no other resources but military ones existed, or could be provided for civil aviation.

Advancement of civil aviation in Italy has always been the responsibility of the Air Force. Thus Italy claims that no clash of interests exists between civil and military requirements. Both are looked after with equal enthusiasm by the Air Force, which is proud of its contribution to the recovery and rapid expansion of civil aviation. In this sense complete integration of the control of flying in civil and military aviation is claimed to exist already in Italy—in that one authority, namely the Air Force, controls both.

The decision not to join Eurocontrol was taken by the Air Force in the name of civil aviation, on the grounds that it would involve Italy in very considerable expense in order to achieve what was already fact, i.e., the integrated control of civil and military flying. One particular factor which had much influence was that Eurocontrollers who would have had to be provided by Italy would have to be paid at very high rates as agreed by the other members. This would have created various difficulties in Italy, particularly financial ones; the controllers' union in Italy strongly supported the joining of Eurocontrol.

It must be stressed that Italy's civil air traffic control is based entirely on ICAO principles; it is both efficient and safe and is also improving steadily in terms of the modernization of equipment. Italy has already established advisory control above 25,000 ft. and the separation of military traffic is rigid.

Italy has a unitary system of air control and does not accept the view that control of commercial traffic by the military is bad in itself. No serious clash of interests between the civil and military groups has occurred.

On the other hand, there is political support for the view that staying out of Eurocontrol is a retrograde step in relation to European integration. It is very probable that had civil aviation in Italy had its own Ministry, the political decision would have been to join Eurocontrol. Early in the New Year Parliament will consider a Bill to establish a Department of Civil Aviation under the Ministry of Transport—thus removing the military control. Even with this change, however, civil aviation will have to rely on military personnel and equipment for many years to come.

Controlling from Skyways

STRONG-PHRASED criticism, interspersed with light-hearted comment, could well sum up the speeches at the recent GATCO dinner at the Skyways Hotel, Heathrow. The fifth such annual event to be organized by the Guild's London Lodge, it was well attended by both members and their guests, headed by Lord Douglas of Kirtleside and Lady Douglas.

Finding it "difficult to be funny about such a complicated and maddening subject as A.T.C.," the chairman of the British Gliding Association, Mr. Philip Wills, said that he felt sorry for the controllers who were expected to stop mid-air collisions with "stone-age" equipment. Proposing the toast to the Guild, he commented that for years we had been told that we could not have the control facilities until the aircraft were there.

Replying, Mr. J. N. Toseland, Master of the Lodge, said it was the right of all aircraft operators—military, private, independent or national corporation—to navigate the air without the risk of collision and with the least amount of diversion. It was the object of the Guild to promote these aims and he thought that freedom in the air could be obtained through control.

In a lighter vein, Mr. W. C. Woodruff, senior controller at Heathrow, gave a report on a computer at an A.T.C.C. that became unserviceable and automatically played a tape on a G.P.O. line asking for servicing engineers. The exchange, originally a manual unit but now automatic, played back a tape requesting the caller to dial 100 for assistance. . . . This conversation is thought to be still going on.

Proposing a toast to "the hosts," Mr. Reader Harris, Member of Parliament for Heston and Isleworth, introduced himself as the "best hated man" around Heathrow, and very surprised at being invited to the dinner. Referring to his main topic in the House of Commons, the problem of aircraft noise, Mr. Harris wanted to know who was there first—the airport or the local residents.

The Fighting Services

Busy Year of Rescues

BETWEEN the beginning of September, 1960, and Sept. 30 of this year, the Whirlwinds of No. 22 Squadron (Sqn. Ldr. G. L. Verran) and No. 228 Squadron (Sqn. Ldr. J. Badeni) were called out 213 times (40 of them false alarms) for search and rescue work. Operating from eight R.A.F. stations round the United Kingdom coastline, detachments from the two squadrons rescued or assisted 74 persons, of whom 60 were civilians.

During the summer, following a redeployment of rescue detachments, Whirlwinds ceased to operate from Felixstowe, and resumed from Tangmere and Manston. Whirlwinds at Manston were called out 18 times in one week. Altogether, coastline incidents caused by boats or individuals round Britain totalled 123.

As in 1959, when No. 228 Squadron undertook its rescue of the entire crew of the North Carr Lightship in a gale, so in October the same squadron carried out another difficult rescue when its aircraft lifted the seven-man crew from H.M.S. "Barmouth," drifting in raging seas off the Yorkshire coast. Despite 70 m.p.h. winds, the Whirlwinds succeeded in rescuing the sailors when all other efforts had failed.

In May, off Bridlington, a No. 228 Squadron Whirlwind went to the help of the occupants of a dinghy, let down a rope and towed them safely to shore. The same month No. 228 flew the severely injured skipper of the Polish ship "Barycz" to hospital. It flew an R.A.F. doctor to the ship, 75 miles off South Shields, lifted the skipper from the deck, and flew him to Tynemouth Infirmary. A Frenchman suffering from pertonitis was winched from the trawler "Enfant des Houles" off Bishop's Rock by a No. 22 Squadron helicopter and flown to Penzance Hospital.

Last November, No. 22 Squadron logged its 1,000th sortie since it began rescue work. Next March the Service expects to begin re-equipping its two rescue squadrons with Whirlwind Mk. 10s.

Kenya Relief Work

SHORTLY before the Beverley and Sycamore crews of No. 38 Group, Transport Command, took-off from R.A.F. Eastleigh for their return to the United Kingdom last week, the Governor of Kenya, Sir Patrick Renison, thanked them for their assistance in the Kenya flood-relief campaign.

The operation was the largest of its kind ever made by the Service in peace-time. The No. 38 Group detachment Beverleys of Nos. 47 and 53 Squadrons, from Abingdon, commanded by Sqn. Ldr. E. Strangeways, was flown out to Kenya to supplement the Air Forces Middle East transport force based there. The aircraft, each carrying a Sycamore, arrived at Nairobi on Nov. 18, and as soon as the helicopters were unloaded began food-dropping operations.

Flying continuously from dawn to dusk, weather permitting, the Beverleys of No. 38 Group dropped a total of 1,600,000 lb. of food to tribesmen who were completely cut off from all contact with the outside world by extensive floods. This was more than a third of the food dropped by all the R.A.F. aircraft taking part, which so far has totalled more than 4½ million lb. This contribution was made in more than 100 dropping sorties.

The four Sycamores, commanded by Flt. Lt. W. Russell, of No. 225 Squadron from Odiham, were widely and effectively used during the operation. They made 185 sorties, landed 1,500 lb. of medical supplies, and evacuated 21 people for medical attention. Two returned to the U.K. in the Beverleys.

YEOVILTON PRESENTATION.—This month marks the 21st anniversary of the commissioning of H.M.S. "Heron", the R.N. Air Station at Yeovilton. To commemorate the liaison between the base and nearby Yeovil, the C.O., Capt. W. C. Simpson, O.B.E., D.S.O., R.N., presented this 18-in. high silver heron to the mayor, Alderman J. P. Kelly.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. A. P. Dottridge, D.F.C., and Wg. Cdr. P. J. Kelley, D.F.C., to the Department of the Chief of the Air Staff; Wg. Cdr. T. A. Trotter, with the acting rank of Gp. Capt., and Wg. Cdr. R. R. Jack to the Department of the Air Member for Personnel; Wg. Cdr. W. C. Horder and Wg. Cdr. H. N. Phillips, D.F.C., to the Department of the Air Member for Supply and Organization.

Bomber Command: Wg. Cdr. P. J. S. Finlayson, A.F.C., to R.A.F. North Luffenham as Wing Commander in charge of Operations; Wg. Cdr. R. A. B. James to R.A.F. Bassingbourn as Senior Technical Officer.

Fighter Command: Gp. Capt. D. H. Seaton, D.F.C., A.F.C., to Headquarters for operation staff duties.

Flying Training Command: Wg. Cdr. D. H. Keary, D.F.C., to Headquarters for Organization staff duties; Wg. Cdr. W. J. Randall, M.B.E., to R.A.F. College, Cranwell, as Cadet Administration Officer; Wg. Cdr. R. S. Kerby, Wg. Cdr. W. D. Robertson and Wg. Cdr. D. W. H. Smith, A.F.C., to R.A.F. Staff College, Bracknell, for Directing Staff duties.

Technical Training Command: Gp. Capt. R. G. Stone to Headquarters, No. 24 Group, as Senior Air Staff Officer.

Maintenance Command: Wg. Cdr. V. S. H. Duclos, D.F.C., to R.A.F. Staff College, Andover, for Directing Staff duties.

Near East Air Force: Gp. Capt. D. G. Scott, O.B.E., to Headquarters as Senior Equipment Staff Officer.

Air Forces Middle East: Gp. Capt. E. W. Tacon, C.B.E., D.S.O., M.V.O., D.F.C., A.F.C., to be Commander, R.A.F. Persian Gulf.

Other Appointments: Gp. Capt. A. C. L. Mackie, D.F.C., to the Ministry of Defence; Wg. Cdr. N. F. Ruse to the War Office.

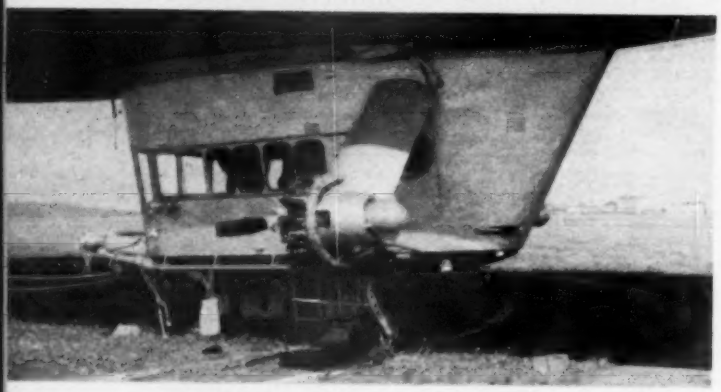
GUTERSLOH VISITORS.—A new sight in Germany recently was this line-up of No. 111 Squadron (Sqn. Ldr. K. A. C. Wirdnam) Lightning F.1As at R.A.F. Gutersloh. One of the purposes of the short detachment to the 2nd A.T.A.F. station was to give ground crews practice in handling Fighter Command's newest aircraft.

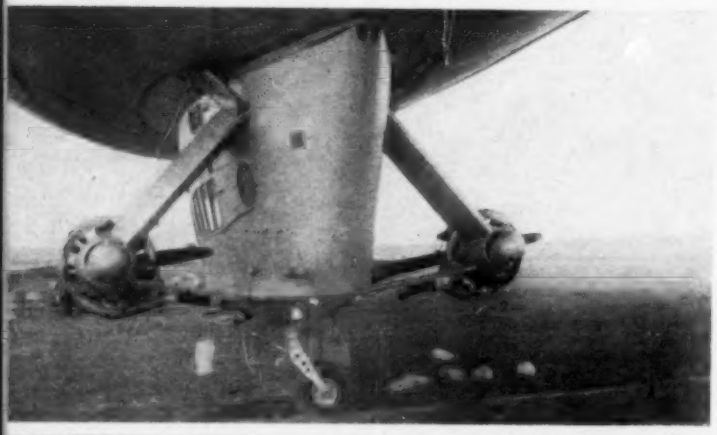
An Airship Tour—1961

by Lord Ventry

I WAS able last August to visit Germany and the United States and to make ascents in three of the five airships which are still flying.

After travelling to Frankfurt by Lufthansa Viscount on July 31 and meeting the people who are operating the Trumpf and Schwab (late Underberg) airships, I was flown the next day to Hamburg to see these two German airships. At Lübeck we found the Trumpf, with a newly decorated envelope, on one of the two mooring masts. The second mast was due to be used by the Schwab, which was expected in a day or two. The manager of the Schwab, Herr K. Selzerr, came along and invited me to fly later in the ship from Bremerhaven back to Lübeck.





Above and below are views of the car of the Trumpf airship, with its two 185-h.p. Warner engines and reversible propellers. Air scoops are incorporated in the faired engine bearers and there is an auxiliary blower in the car. Note the single-wheel castoring "undercarriage."

We watched the Trumpf, with four up, take off at 3 p.m. She returned at 6.15 p.m. and left again at 6.30 with Herr G. Schmidt piloting and with a co-pilot and myself on board. It was a bright, sunny evening and although, when over Lübeck, we flew at over 1,000 ft., for most of the time we cruised along at some 500 to 700 ft. We had a splendid view of Lübeck, which is an old Hanseatic town with some fine Gothic buildings.

We flew out over Lübeck Bay and along the Baltic coast. As usual, everyone looked up as we cruised quietly overhead at about 35 kt., and we received many greetings. We then returned to Lübeck, flying over and around the city, and returned to the airport at 8 p.m.

With the help of our auxiliary blower in the car and reversible propellers, we made a very slow landing in spite of the fact that there was very little wind. The seven men of the landing party soon put the ship on the mast, for this was the final landing. Trumpf has a volume of 156,000 cu. ft. and her twin 185-h.p. Warner engines give her a speed of some 55 kt. She is an excellent little airship and is doing fine publicity work for the Trumpf chocolate company of Aachen. This airship had, by Oct. 20, flown 900 hr. during 1961.

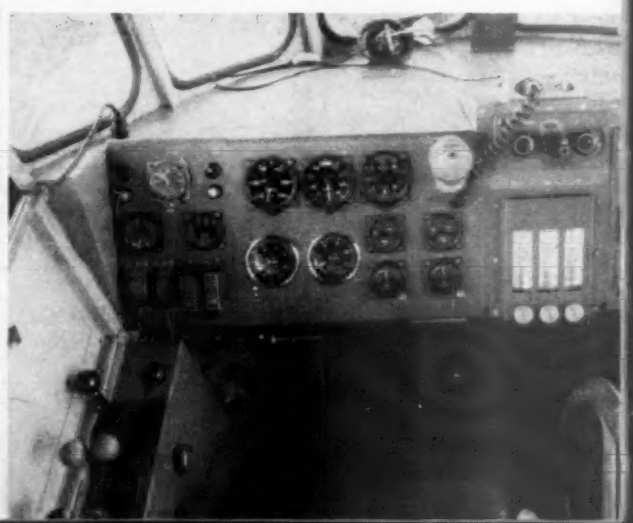
On the next morning, Aug. 2, I took the train for Bremerhaven to join the Schwab. There I was met by the co-pilot under training, Herr Herbert Vogschmidt, who motored me to the country hotel where the crew were living. I was told that the Schwab had flown 520 hr., in spite of much bad weather, since its inflation at Stuttgart in May.

A little later, when we were at the airport, the Schwab flew over. The weather was clearing to the westward, and so the ship flew off to dry its envelope, reducing heaviness from some 300 lb. to 70 lb. Compared with that of the Trumpf, the landing was comparatively fast, but the two men detailed to man the fore guys, which are some 60 ft. in length, did so quite easily. Others grabbed the handling rail, which is attached to the outside of the car, and they then walked the ship up to the mast.

Her mooring cable was made fast to the mast's cable and she was then pulled up to the mast, so that the cone on the ship's bow could be pulled down into the hollow cup on top of the receiving arm at the masthead. The cone was then locked into position and the load taken off the mooring cable. The airship was then free to swing head to wind, the car wheel castoring on the ground. The Schwab airship has no reversible propellers or integral blower, so, if there is no wind, a relatively fast landing is inevitable—which keeps the handling party in good training.

Because of poor weather on Aug. 3, there was no point in flying to Lübeck, but during the afternoon conditions improved. I spent it with Herbert Vogschmidt, who was keeping the mast watch, and, by watching the airspeed indicator, we saw that the wind was dropping and the sky was also clearing. There were

On the left is the Trumpf ship (D-LEMO) and below is its control cabin, showing the elevator wheel and the rudder pedals.



Above is a view inside the car taken during a flight in the Underberg—now the Schwab, which is seen on the right.

frequent changes of temperature as the sun played hide-and-seek with the clouds and each time the sun went in an auxiliary blower, which was attached to the handling rail outside the car, had to be set going. This is an excellent way to learn the position of the various ballonet and valve controls, for they have to be used every time air is blown in.

Just before 6 p.m. Herr Hess, the ship's one and only licensed pilot, decided to carry out a local flight, and the two of us set out soon after, remaining airborne for just over three hours.

Climbing to about 500 ft., we flew up the River Weser to Brake and back. He let me fly the ship for a time and we flew over, and often around, all the townships and villages, climbing to over 1,000 ft. when over big towns like Bremerhaven. As usual, we seemed to cause a lot of interest on the ground.

Back at Bremerhaven, Hess made an "aeroplane" landing, taxi-ing up to the landing party of seven.

On Aug. 5 I left Frankfurt in a Lufthansa (L-1649) freighter at about 1.30 a.m., landing at Ringway, Manchester, to deliver a Rolls-Royce engine and to pick up more cargo. We took off again at 5.30 a.m. with 8 tons out of a possible 12 tons of cargo on board. There were 12 in the crew, including a "Super Cargo," who spent a lot of time typing away at a table behind us, getting through as much of the paper work as possible. After an uneventful journey, with some fine views of icebergs off Newfoundland, we landed at New York soon after 2 p.m. New York time.

At 3 p.m. on Aug. 6 I was picked up in New York by a naval car sent by Capt. F. Klein, who commands Lakehurst naval airship station N.J. On arrival at Lakehurst I was greeted by Capt. Klein, who at once took me down to the airship sheds. There are six of these, but soon only the original shed will be used to house airships, for all except two are being deflated—although they are being kept in reserve.

The next day Cdr. Ashe came for me for a flight in one of the two remaining ZPG-2 airships. We found her on the mast on the landing ground. With a volume of 1,011,000 cu. ft., she has a length of 343 ft. and is 96 ft. high. With twin 800-h.p. Curtiss Wright engines she has a speed of about 70 kt., and she carries a double crew of 14 on A.S.W. patrols.

Before leaving the mast, two yellow-coloured mules, each weighing 37,000 lb., were brought up. With four-wheel drive and steering, they can tackle any kind of surface and reach a speed of 32 m.p.h. Each mule has a crew of two, a driver and a winch operator. A third hand connects and disconnects the handling guys from the cables on the drums on the mules. When off the mast these mules take up the slack of the guys and replace the men that used to man them. The U.S.N. required 40 for the K-class ships of 456,000 cu. ft. Under quiet conditions only 10 are required for the ZPG-2.

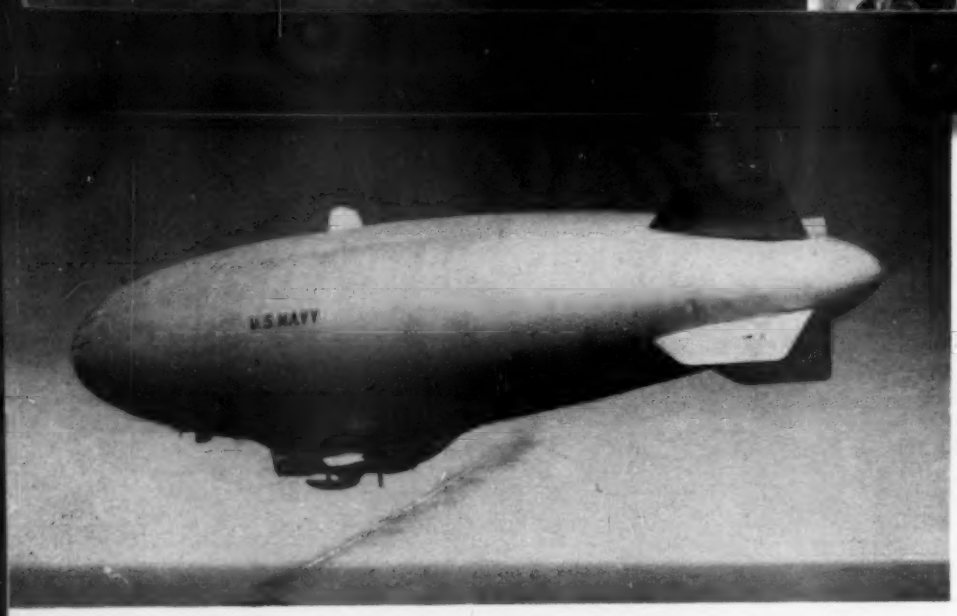
Once off the mast, the bow guys were held by the mules and the ship taxied off round about 3,000 lb. heavy at a speed of about 35 kt. The run was quite short for, of course, most of the load was lifted by the gas. Cdr. Shannon was the pilot.

Capt. Klein and Cdr. Ashe came along and so, including the scientists, there were 12 on board. The ship was being flown for calibration purposes. Usually a scale model of an aircraft hangs below the car on a tubular strut, for the ship was replacing wind-tunnels. It is being used especially for VTOL and low-speed trials of supersonic aircraft designs. Neither aeroplanes nor helicopters can be used for this type of research and conventional wind-tunnels were found to give very inaccurate results. Hence the use of the airship, which has been found to be admirable for this purpose. It was, indeed, the scientists who had asked for the two airships to be retained for at least a year.

The control portion of the car of the ZPG-2 was very roomy and there was an unequalled view from the big, wide-open windows. It was all very different from the cockpit of an aeroplane—though airship controls are now very similar, a steering wheel being mounted on top of a column which is

Below is another picture in the control cabin of the Underberg with its pilot, Helmut Gülsdorf, in the left seat.

Below is the car and starboard engine of the Schwab, showing the auxiliary blower.



A U.S. Navy ZPG-2 as equipped for A.E.W. purposes. This type of airship—impressions of which are given by the author of this article—made its first flight in February, 1955.

moved back and forth like the control column of an aeroplane. So the traditional fore-and-aft elevator wheel has at last disappeared. The pilots spoke highly of the new arrangements, and it saves manpower if one person can fly the ship, and it makes landings easier.

But it is often less tiring if one pilot can steer and the other act as height coxswain. So the controls are duplicated and one pilot can attend to elevation while the other is steering. The ship is also fitted with an autopilot. Switches between the two pilots replace the former knobs and toggles of the air and gas controls.

There are three ballonets, those forward and aft being used for trimming. While flying, air is supplied from the propeller slipstream, the air scoops forming a portion of the engine bearers. There are also electric blowers for use when landing, or when flying slowly. The airship was extremely steady, though our average altitude was only some 700 ft., and there was very little vibration.

I was taken for a tour of the ship. The bay just aft of the control car is now empty, as the electronic devices have been taken out. The engines are inboard and it was very hot and noisy in the engine-room. They drive a pair of three-bladed propellers, which can be feathered and are reversible. The engines are very accessible and, under 40 kt., one engine can drive both propellers. Aft is an excellent look-out—for visual spotting still has its uses.

The car is 80 ft. in length. The main suspension is inside the envelope, consisting of curtains terminating in bridled wire cables. These come out through the bottom of the envelope and the car is attached to them. There is also a secondary suspension. This is faired in, so the car and envelope form one unit.

We climbed a short ladder to the top deck, which is fitted out with bunks, galley and space for off-duty crew. Crew comfort is essential, as these ships were designed for A.S.W. patrols of long duration. A ship of this class has flown for 264 hr., or 11 days, without refuelling—a World record. An A.S.W. patrol of 90½ hr. has also been completed.

Fitted originally with cotton neoprene envelopes, these ships had a duration, at cruising speed of some 46 kt., of 30 hr. The next envelopes were made of the Goodyear Dacron fabric, which is lighter and stronger. This gives the ships an endurance of 60 hr. But if Du Pont's Mylar fabric could be used the endurance would be increased to 120 hr. This means a range at about 46 kt. of 6,000 miles or more and can be contrasted with an A.S.W. frigate with a range of 3,000 miles at 20 kt. Both craft can, of course, be refuelled as required.

Mylar fabric is also five times as strong and is a still better gas holder. Although this is not certain, it is believed to have a life of about 10 years, which would be double the average life of the present material.

As Mylar can stand up to temperatures of 500° F., it has already been used for hot-air balloons and it opens up the possibility of utilizing thermal control in airships. If the gas could be superheated at will, the ship could be given a false lift as and when desired. If this could be done at the beginning of a flight, a really heavy ship could be made to rise vertically like a free balloon, with engines idling. Then, as the gas cooled and the ship gathered way, her dynamic lift would keep her in the air. The "Hindenburg's" payload might have been increased by 14 tons if use could have been made of her dynamic lift. But, as airships are being given up, there seems little prospect of the breed being improved.

While looking over the ship we had been flying a little out to sea up and down the coast, and it was now about 2 p.m. and four hours since leaving the base. As the job in hand had been completed it was decided to land. Conditions were by no means ideal, for the sun was blazing down from a clear sky and the landing was to be made on black asphalt.

An airship is first ballasted up. She is brought head to wind and, with engines slowed right down, the static condition is ascertained and it can be seen whether she is heavy or light, or bow or stern heavy. We were heavy and static trim is corrected by blowing in air or valving air from the fore and/or aft ballonets.

We came down from about 300 ft., approaching aeroplane fashion, but at only some 15 to 20 kt. Once on the ground, however, we were caught by a minor whirlwind and so, after dropping 1,000 lb. of water ballast, the pilot took off again. Another turn round and this time there were no difficulties. It was about 2.25 p.m. and we had been airborne for four and a quarter hours.

It was very interesting to watch the mules. The two fore guys, having been seized by a couple of men, were run out to their respective mules and made fast to the cables on the mule winches. The cable slack was taken up and the airship was held and then put on the mast. Once on this, she could turn always to wind with the car wheel castoring on the ground. All the electrical services required by the airship were then supplied from the mast, including engine starters and the powerful blowers. Only 16 men were required to land this big ship, 10 sufficing in calm weather.

Later I had a chance of inspecting one of the ZPG-3W ships before she was dismantled.

These are larger editions of the ZPG-2 ship in which I flew, with a volume of 1½ million cu. ft. Their cars are more roomy, for they carried crews of 22, and their engines are outrigged but are still accessible in flight. One of the great advantages of the airship is that engineers can not only maintain their engines while airborne, but carry out extensive repairs. This makes airships more reliable and basically safer than other types of aircraft.

Although all these early warning airships have been withdrawn, it is a fact that NORAD, which employed them, were so pleased with the good work they did on the east coast that they applied for an airship squadron for the west coast—a request that was turned down. Carrying the most advanced of any aircraft radar, these airships proved capable of tracking far outside the range of patrol aircraft. The airships flew in all weathers, remaining on station for periods of up to 50 hr. If they had been equipped with the new Mylar fabric for their envelopes, their endurance would have exceeded 125 hr. The airships proved cheaper to operate than the heavier-than-air aircraft and, due to the greatly reduced gas diffusion and probable longer life of Mylar fabric, the airship's operating costs could have been reduced if this fabric had been available.

Cdr. Ashe took me to watch our airship take off and then I went to his office to hear more about future possibilities. As a result of experiments and studies in connection with boundary layer control, airships equipped with helicopter-type rotors on the stern of the envelope would have speeds of up to 100 kt. (115 m.p.h.) and, as these rotors would be used for directional control, an airship could be "steered" while standing still in the air. Provided that the airship was in equilibrium, she would be under full directional control however slowly she was brought in to land. Higher speeds with present horse-power would reduce the amount of fuel and so increase the payload and make the airship more attractive from a commercial standpoint. Talking of landing, the Commander rightly pointed out that the airship of today has such powers of endurance, or could be so easily refuelled, that there is no longer any need to risk landing under difficult conditions.

Before returning to New York, I stayed up to about 2 a.m. to watch the airship make a night landing. This time she was very light and for once helium had to be valved—a rare occurrence. There was an 8-m.p.h. breeze, which was blowing across the shed door. The after guys were held by heavier mules and, with the ship on the transporter mast, she was docked with ease, 16 men, at the most, being employed.

Book Review

THE HISTORY OF AIRSHIPS. By Basil Clarke. 194 pp.; 5½ in. by 8¼ in. Illustrated. Published by Herbert Jenkins. Price 21s.

THIS is a very difficult book to review. I would like so much to praise it. The author is fair to airships and puts up a good case for them, both from a commercial and a naval standpoint. There are many interesting plates, one or two being very rare ones, and the book is well written and very well arranged. But, alas, there are many errors which will soon be spotted by those who know their airship history.

Nobody knows better than this reviewer how difficult it is to avoid mistakes. Even the official and semi-official records do not always agree; and the Press, alas, is very often quite wrong when it comes to airships. Mr. Clarke must have taken a lot of trouble to get his facts right, and it seems ungenerous to stress all this. Yet it must be done in fairness to those who buy the book.

He begins by stating that I commanded a naval airship in World War One. Of course this is quite untrue. I have never in my life been in sole command of any airship, or flown in an airship on wartime missions. All my airship flying has been in peace-time.

In fairness to our French and Italian allies, it should also be pointed out that the author has very gravely underestimated the very good work done by their airships in the First World War. Their army airships, filled with hydrogen and using equally dangerous petrol, made many raids over the enemy lines. From October, 1915, onwards they had to face incendiary attack and the French crews had to fly over the most heavily defended of fronts and attack equally well-defended targets. Yet they carried on until they were made to stop. The Italians used airships for raiding right up to November, 1918, going out in fog which grounded, and would still ground, aeroplanes.

The French naval airships especially did excellent work in the last two and a half years of the War, and when the French and Italian airships were with convoys no surface craft were lost.

In a book of only 181 pages of text it is quite impossible to cover the history of airships in any detail, so the result must be rather sketchy. As a consequence there are many names which should by rights be mentioned but are omitted. Often there is very little detail of good work done; and very few statistics are given.

The late Major Scott is, of course, mentioned in connection with the Atlantic flights he pioneered in R34 and R100. But his work in connection with the mooring mast is, I think, much more important.

Up to the Pulham trials in 1921, it took perhaps 200 men to handle a rigid airship. Due to the methods, for which Scott was mainly responsible, it was shown that R33 and R36 could leave the mast in virtually any weather, with the help of only two men, and that they could land in winds of up to 32 m.p.h. with the aid of 10 men. This was a huge step forward.

It was also proved that hull repairs, engine and gasbag changes could all be done while the ship was on the mast. British airships did not benefit much, but to this day all other airships do so. It was, by the way, on the Pulham mast—and not at Howden, which never did have a mast—that R36 was damaged.

Wg. Cdr. Booth's epic flight in R33 is, of course, mentioned. And for the record it might be added that he commanded the first of the SS ships, the little SS1, and the last of our rigids, the R100.

There are so many good things in this book—among them Capt. Eppe's talk on naval airships—that it is to be hoped that a second edition will soon be called for. Then it will be possible to make the necessary corrections, and this will result in a very useful book.—VENTRY.

Publications Received

Air Hostess, by Monica E. Tyndall. A clear exposition of the life and work of the stewardess, published in a "Target for Careers" series. The authoress is an instructress at B.O.A.C.'s Cabin Services Training Unit. 110 pp., 4¼ in. by 7 in. Illustrated. Robert Hale, Ltd., 8s. 6d.

Fighters, Vol. IV, by William Green. This completes the survey of all fighting aircraft used in World War II, published as part of a larger series entitled "War Planes of the Second World War." The products of the U.S.A. and Yugoslavia are here described and illustrated in the same concentrated detail as those of other combatant nations in the previous three volumes. 208 pp., 5½ in. by 5 in. Macdonald and Co. (Publishers). 9s. 6d.

Electricity in Transport, by B. K. Cooper. A new title in the Mechanical Age Library for younger readers. Includes a chapter on electrical equipment at airports and in aircraft. 144 pp., 4½ in. by 7 in. Illustrated. Frederick Muller, 9s. 6d.

Aircraft the World Over, by Kenneth Munson. With nearly 300 photographs (some in full colour) and good clear text describing the uses of aircraft past, present and future, this is a ready-made Christmas gift for any intelligent youngster. 144 pp., 7 in. by 9½ in. Ian Allan, Ltd., 15s.

U.S. Army VTOL Programme

AS we briefly recorded in our issue of Nov. 30, 1961, General Electric has been awarded a $6.9 million contract by the U.S. Army Transportation Research Command as initial support for two VTOL test-bed aircraft using the G.E. J85-5 fan-lift engine. The complete programme, which covers two years and will cost $10.5 million, includes the construction of the two fan-lift airframes by Ryan at San Diego.

Purpose of the programme is to evaluate the flight characteristics of the fan-lift propulsion system in hover and transition, and to demonstrate in flight that the fan-in-wing configuration is compatible with high subsonic aircraft requirements. The two research aircraft will be designed to fly at 450 knots.

Left and above, artist's impressions of the Ryan VTOL test-bed aircraft for the G.E. J85-5 fan-lift engine.

The G.E. fan-lift propulsion system consists basically of a J85-5 turbojet and a 6-ft.-dia. tip-turbine lift fan, which can be installed in either wings or fuselage. For vertical flight, a diverter valve directs the jet exhaust to the tip turbine to drive the lift fan. The fan supplements the available thrust of the basic engine which is designed to meet cruise conditions. For forward flight, the diverter valve closes the fan off and allows operation as a conventional jet aircraft.

U.S. Army flight research aircraft will use the wing-mounted configuration. The exhaust from each engine is divided to drive both fans for engine-out safety. With one engine inoperative, both fans can still provide about 60% of their design lift.

Is This the Vostok?

KENNETH GATLAND reviews the Soviet colour documentary film "Again to the Stars," and puts some further questions concerning the configuration of the Vostok spacecraft.

The model of Vostok II as it appears in the film, "Again to the Stars." Principal features are the blunt nose of the pressure capsule (left), the panel or "stabilizer" behind the nose, the fin-supported annulus and the back portion containing shutters which open and close.

AMONG the more tantalizing aspects of the film, "Again to the Stars," depicting the 25 hr. 18 min. 17-orbit, mission of Major Gherman Titov on Aug. 6-7, are the several glimpses one receives of a model of the spacecraft as it might appear in orbit. The model, seen in our heading picture, appears to bear little resemblance to the spacecraft seen in the earlier Soviet film, "With Gagarin to the Stars" of which a review appeared in THE AEROPLANE AND ASTRONAUTICS of Aug. 24, 1961, p. 214. According to an article in *Pravda* on Sept. 8, Vostok II differed from the craft which carried Major Gagarin "in having a new type of air regeneration system," but no mention was made of other changes represented on this model.

The film itself has been shown privately at the Soviet Embassy during the past few weeks. It begins with an account of Major Titov's physical training programme which seems to be as strenuous as one could rationally devise. The prospective cosmonaut is seen exercising on a steel-framed swing which twists around the longitudinal axis as well as rotating around the cross-bar; and on this Titov completes full circular swings, up and over. He is next seen bouncing on a trampoline and then, on more sophisticated apparatus, standing near the rim of a large flat disc which is continually rocked to and fro while he strives (successfully) to maintain his balance.

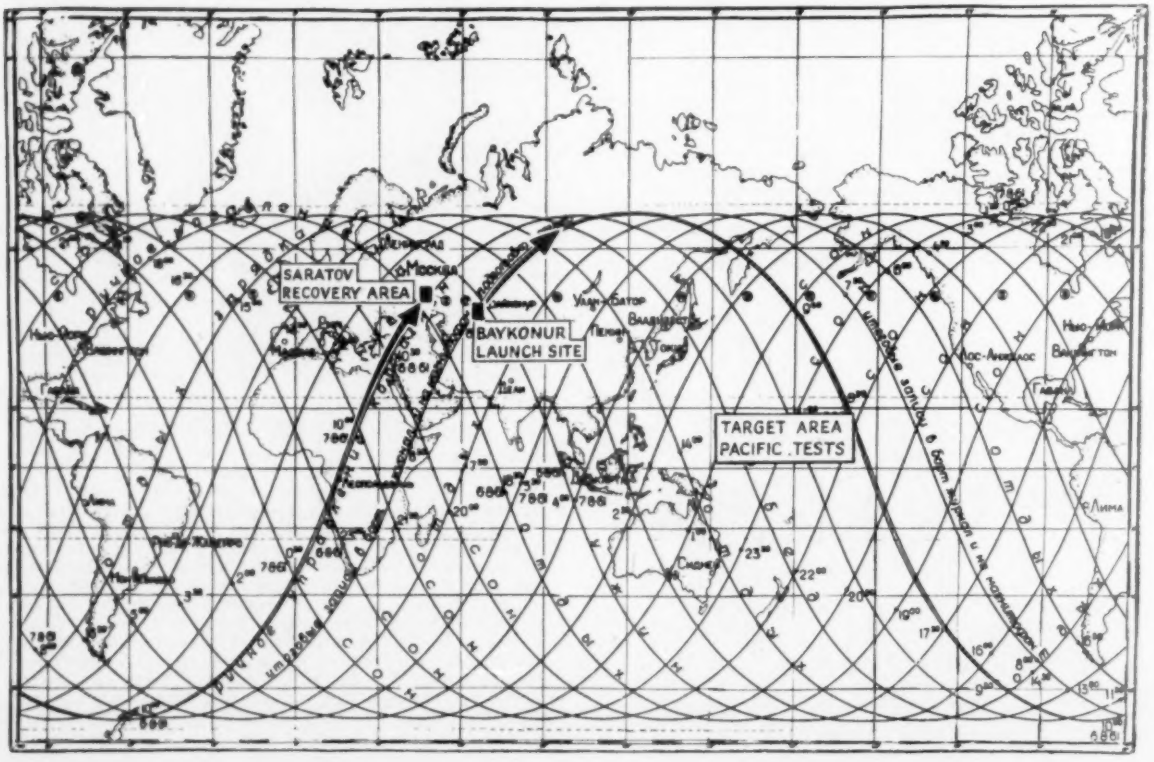
In athletic kit, Titov next appears running on an endless belt with leads coming from the region of his chest recording heart-beats and respiration. His blood pressure is checked immediately after the belt comes to rest.

The most diabolic apparatus of all is without doubt the capsule mounted on gimbals in three axes in which at speed Titov is rotated, spun and tumbled in most disarming fashion. The commentary informs us that during this test he answered questions put to him by the operator at an adjacent control console.

After the violent activity comes complete rest—in an isolation chamber for "many, many days." Although it was not on the programme, we are informed that Titov recited verses by Pushkin; and the occasion is taken to review by the device of flashbacks Titov's early life in Southern Siberia.

Vostok Simulator

Next come scenes of pre-flight training in a Vostok simulator. The familiar instruments are seen within the cabin, including the "optic orientator" on one of the portholes and the instrument containing a globe of the Earth which in practice revolves synchronously with the Vostok's movement over the Earth. Titov demonstrates how this is reset manually



The 17 orbits performed by Vostok II on Aug. 6-7 superimposed on a flat projection of the Earth. The impact area for Soviet missile launchings into the central Pacific is adjacent to the departure trajectory.

on the basis of the precise orbital parameters relayed by ground tracking stations.

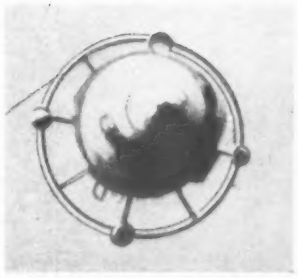
After this comes ejector seat training—first on a tower rig and then actual ejections from a modified Il-28 aircraft. One shot involves two parachutes, one for the pilot and one for the seat. However, in another sequence, Major Titov is seen descending into water still apparently in the seat, and then in the act of climbing into a rubber dinghy and lighting a smoke flare.

The last days before the launching are spent in a country sanatorium where complete rest is the order of things. Titov is seen being interviewed by a doctor, who asks how he feels, what did he think about his training, and what were his thoughts when he watched his colleague Major Gagarin set off on his pioneer mission? He replied that as a trainee cosmonaut he followed each moment of the launching, and when Gagarin was in orbit he felt that everything was all right.

Finally, a special medical commission reviews the physiological and psychological data amassed during Titov's training and the chairman is seen putting his signature to a document approving Titov as ready to go into space.

While the co-ordinating computing centre prepares for the launching, with the aid of maps and transparent overlays indicating the intended flight path at every stage of the mission, Titov enters the dressing room at Baykonur and is fitted with his pressure suit, orange-coloured flying overalls, and white helmet. The light-blue bus, familiar to those who saw "With Gagarin to the Stars," conveys him and his attendants to the launch pad.

Seated immediately behind Titov is another helmeted figure in the same "space garb," though one never sees his face. This is the "bachelor astronaut of iron self control and courageous resolution," whom Titov later described as Cosmonaut No. 3.



Above, the evidence of Tushino—allegedly the Vostok I spacecraft borne by an Mi-6 helicopter.

Left, a "head-on" view of the Vostok from a picture taken at Tushino showing the tail annulus to good effect.

Had any emergency arisen which prevented Titov from making the flight, this unnamed cosmonaut would have taken over. Titov, we are told, occupied the same reserve seat in the bus when Gagarin arrived for his mission on April 12.

The Launching

Arriving at the launch pad, Titov walks with his retinue to the base of the gantry, exchanges farewells, and mounts the stairs to the lift which conveys him to the nose of the booster. Again, however, there are no details to be seen of the rocket and just as the lift reaches the point where one might expect to see the second stage interconnection, the film cuts abruptly to a view of Titov coming out of the lift at the top on to a railed platform. He acknowledges the camera and turns to enter the Vostok—but again the film is cut a fraction of a second before he reaches the spacecraft.

Comes the moment of lift-off. Exhaust from a single rocket engine is seen blasting through an aperture in a raised platform; and from a billow of smoke above the pad, like a phoenix from

The two-part spacecraft seen in the earlier Soviet film, "With Gagarin to the Stars." Was this perhaps a dummy used in the Pacific test series which preceded Major Gagarin's orbital mission on April 12?

the ashes, rises the familiar shape of a single-stage T-1 medium-range SSM. A similar rocket vehicle was used to simulate the launching of Vostok I in the previous film.

This is the first and only view of any rocket hardware; separation of the Vostok from the final stage of the carrier rocket is indicated by a blurring of an oscilloscope trace. Although the film does not include a shot of the actual spacecraft, the previously mentioned model appears several times against a star background. At one stage, it is shown as though being orientated, to illustrate the effects of manual control.

One's first impression of the model's configuration is that it differs markedly from the spacecraft seen in the film "With Gagarin to the Stars," and the spacecraft exhibited beneath an Mi-6 helicopter at the Tushino air display in July.

Let us recall the evidence of these two sources. The Gagarin film gave us a fragmentary glimpse of a two-part spacecraft being joined. The front portion with a pointed nose-cone appeared to be the pressurized capsule which contained the cosmonaut, while the rear portion bore a close resemblance to the final stage of the carrier rocket which launched the Lunik probes.

It seemed logical to assume that this tail component contained the retro-rocket and possibly research instruments and telemetry equipment and that this was jettisoned after retro-firing and before the vehicle entered the denser layers of the atmosphere. A twin-barrel housing visible on top of the spacecraft, apparently concerned in joining the two components, was suggestive of a piston-separating mechanism.

This appeared to be in line with the *Pravda* text concerning the 17-orbit flight of Spacecraft II containing the two dogs Strelka and Belka. After the ship had passed into its descent trajectory, "the instrument compartment was separated from the cabin and burned up as it entered the dense layers of the atmosphere." This section was stated to contain telemetry equipment; part of the apparatus for studying cosmic rays and short waves emitted from the Sun; equipment associated with guidance in orbit; heat regulation apparatus; and a powered deceleration unit.

The Tushino exhibit was basically similar in configuration except that the tail section now supported a fin-mounted annular "aerofoil" giving the vehicle a bomb-like appearance. Distributed symmetrically around the annulus were four small canisters intersecting with four of the eight fins indexed at 45°. At this stage, it seemed a fair conclusion that the tail appendage served merely to prevent the spacecraft twisting on its cables beneath the supporting helicopter.

The question of whether the Tushino exhibit was actually the recovered Vostok I or a replica was dealt with—one cannot say *answered*—by Major Gagarin himself in a B.B.C. television interview during his visit to Britain in July. He said he could not say whether the vehicle shown on that occasion "was the actual spaceship or an exact replica."

If it *was* the actual vehicle, it was remarkably intact, for the highly refined nose showed no apparent deformation or damage and close-fitting aerials were discernible immediately forward of the rear (detachable?) component. If, according to earlier speculation, the tail section was jettisoned prior to re-entry, at least this must have been replaced.

It may be helpful at this juncture to make a further reference to Soviet published accounts. These are selected quotations relating to the re-entry of Vostok-type spacecraft:—

1. "Before descent, the vehicle is properly orientated in space, then the retro-rockets are fired to reduce the speed to the desired level—sufficient to deflect the path slightly downwards towards the atmosphere" (Blagonravov, *Soviet Weekly*, Aug. 17, 1961, p. 5, concerning Vostok II).

2. "After the ship had passed into its descent trajectory, the

Picture taken from orbit by Major Titov using his Konvas ciné-camera.

instrument compartment was separated from the cabin and burned up as it re-entered the dense layer of the atmosphere" (quotation from *Izvestia* concerning Spacecraft II).

3. "Heat protection was further improved by making the recoverable nose-cone as streamlined as possible and by cladding it in a suitable material" (Blagonravov, *Soviet Weekly*, Aug. 17, 1961, p. 5).

4. "At the beginning of the descent when the ship is still very high up and the surrounding atmospheric density is small, it does not slow down fast enough. To brake faster on this section of the trajectory, a parachute could be used. This 'high altitude' parachute is of an unusual type. Since it will not open up itself because of the low atmospheric density, it must be made to do so by means of special devices" (Yuri Sheshhov, *Soviet Weekly*, April 20, 1961, p. 9, concerning Vostok I).

5. "If *g*-loads on both take-off and descent were to be kept within the safety limit, the launching and flight had to be planned accordingly and acceleration forces ought to be limited to a transverse direction—that is chest-to-back. This purpose was served by a suitable seat" (Blagonravov, *Soviet Weekly*, Aug. 17, 1961, p. 5).

6. ". . . a manned flight called for the ultimate in safety. This was the reason why an ejection seat was installed in the cabin and a parachute system was placed at the disposal of the cosmonaut who could use it once he was in the lower atmosphere" (Blagonravov, *Soviet Weekly*, Aug. 17, 1961, p. 5).

What can we learn from this? The words of Sheshhov are obscure; he says a special high-altitude parachute which opens despite the rarified nature of the atmosphere *could* be used to reduce re-entry speed. A similar device has been considered by NASA in America which takes the form of a large-area drag-brake manufactured of wire-mesh and sealed with a silicon compound.

Prof. Blagonravov, for his part, refers to reducing frictional heating by streamlining the nose-cone. In fact, a blunt nose is more effective in shedding re-entry heat by creating a large wave in front of the body which can convey something like 99% of the heat energy into the atmosphere. On the other hand, with a sharp-nosed vehicle, roughly 35% of the total amount of energy can go into the body.

It is true, of course, that the use of ablative materials lessens this problem and more streamlined nose-cones (that of the Minuteman ICBM, for example) have been developed which carry away much of the heat energy in the process of vaporization. One may assume that the Vostock embodies such ablative material. The great disadvantage of the blunt re-entry body in the case of a ballistic missile is that the vehicle spends a fairly long period in the altitude region where the speed is low, and is then more subject to wind drift when it comes down and may tend to drift off target.

Drawing and Model Compared

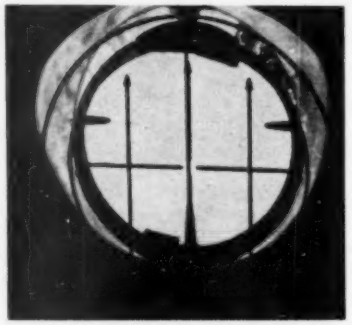
To add further confusion to the story, we now arrive at the artist's impression which, according to *Pravda*, was drawn by a friend of Major Gagarin's. Gargarin writes: "Although the spaceship portrayed by my comrade is somewhat provisional it still seems to me that everything else closely resembles what I saw in space. The picture closely resembles the photographs which Gherman Titov brought back from his spaceflight."

Does this mean that only the background is realistic? Whatever the answer may be, the Soviet film-makers have come up with a broadly similar configuration.

The artist's impression had basically the same appearance as the Tushino exhibit with the same tail-annulus but with "paper-clip" antennae sprouting from nose and tail. An exhaust flame issues from the back of the vehicle—on the centre-line. (THE AEROPLANE AND ASTRONAUTICS, Sept. 28, 1961, p. 433.)

"Again to the Stars" brings us to another variant on the same theme. Significantly, the model includes the tail annulus; but now, for the first time, appear small "fore-planes" projecting from the region of the pressure cabin giving the vehicle the appearance of a squat canard with an annular "wing" at the back. Instead of being pointed, the nose is now hemispherical, and another significant departure is that the back end of the spacecraft actually projects beyond the tail annulus instead of stopping short inside. This tail extension is seen to contain radial shutters which open and close, clearly representing part of the vehicle's temperature control system.

The "fore-planes," visible in our heading picture below the antennae cluster on the back of the model, bear some further



A porthole in Vostok II.

description. They have the form of a clipped delta, but instead of being swept back, they present an unswept leading-edge. The vehicle is now festooned with rod-like telescopic antennae and, whatever else happens during re-entry, most of these must obviously be jettisoned.

Before leaving the model, one must seriously question whether the delta-shaped panels and the annulus are meant to represent aerodynamic surfaces, for if they do, how are they prevented from burning off under re-entry heating? A Soviet official has suggested that much would depend on the speed with which re-entry occurred and that some rocket-braking may take place on the re-entry path, making aerodynamic surfaces both possible and available for control in the lower atmosphere. Many aerodynamicists would doubt that the arrangement depicted would be feasible.

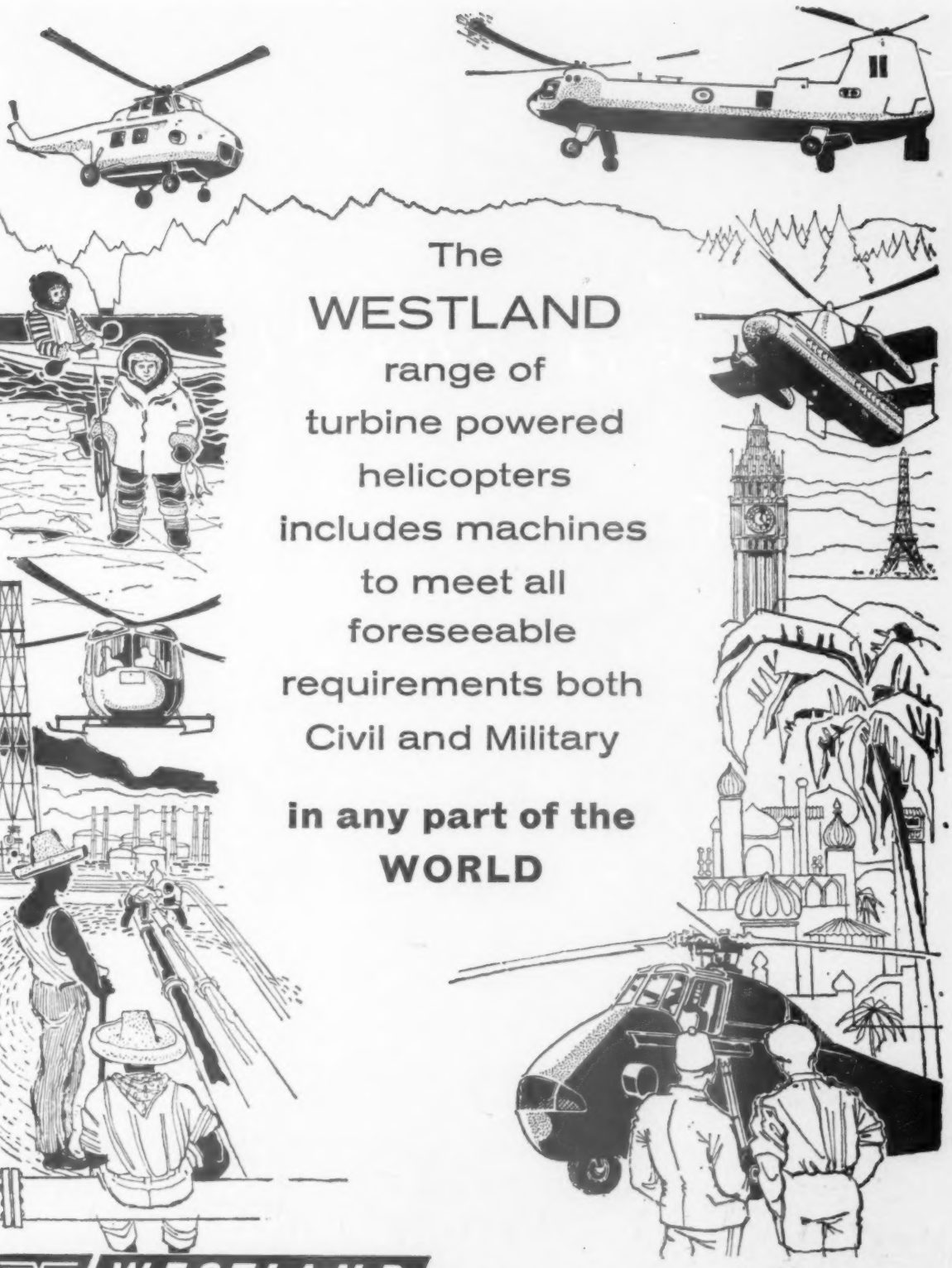
On the other hand, is it possible that these surfaces are concerned in some way with the vehicle's refrigeration system and/or the mounting of solar cells? The only other conclusion is that the Soviet film-makers are gently pulling our legs and that, in fact, the actual Vostok is far removed from its public image.

Film of the Earth

One last point remains. When Major Titov was asked during his Moscow Press conference on Aug. 11 if any pictures had been taken of the Earth, his reply was translated in these words: "I took with me an ordinary little camera of the kind used by Press men and with this I took a few snapshots in outer space. The film is now being processed and to tell you the truth I am not at all certain of the results."

In "Again to the Stars," the "ordinary little camera" is revealed to be a triple-lens Konvas ciné-camera. In one brief sequence, Titov is seen leaning forward as though to focus the camera through a porthole directly in front of him. The pictures he secured of the Earth's cloud cover are of high quality; although in "colour," they show the Earth essentially in black and white with a greenish tinge to the clouds. There is no recognizable land mass, but an idea of how Titov may have seen "cultivated fields" and "collective farms" is given by a brief glimpse of an optical telescope which forms part of Vostok's equipment.

Despite the absence of the actual launching rocket and any misgivings one may have concerning the model, the film is well produced; in its present form, it runs for some 50 minutes. One's only regret is that as a documentary account of one of the World's great occasions, it suffers so badly at the hands of the censor. Soviet Export Films expect to release the film for public showing in the near future.



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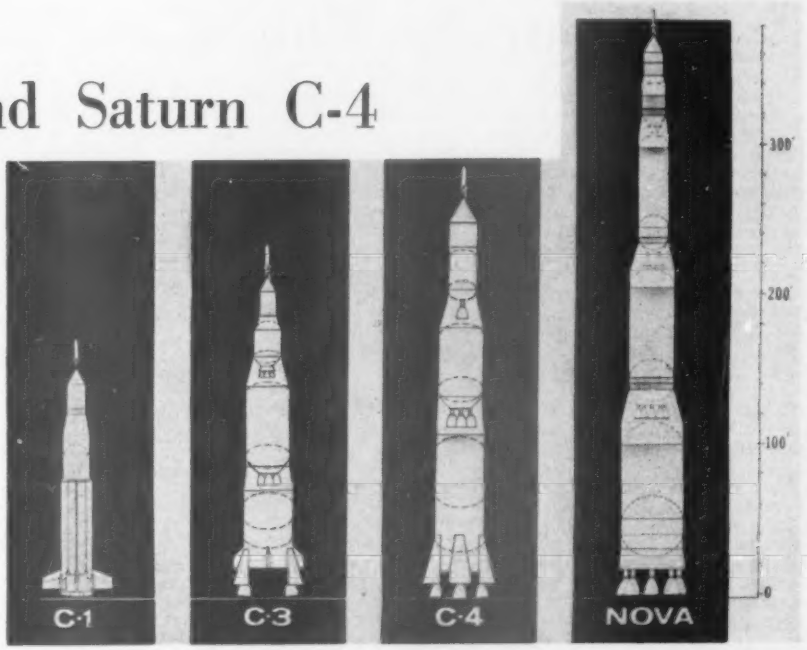
AE.58

Titan III and Saturn C-4

Preparing for a new generation of U.S. heavy space boosters.



Saturn and Nova boosters compared. First, the Saturn C-1 now being developed with eight H-1 engines of 188,000 lb. s.t. in the first stage; second the proposed C-3 with two F-1 engines of 1.5m. lb. s.t. in the first stage; third the Saturn C-4, with four F-1 engines favoured by the Golovin Committee; and finally a liquid-propellent Nova concept with a first-stage cluster of eight F-1 engines totalling 12m. lb. thrust.

AFTER much deliberation the Golovin Committee, which has been considering the future of large U.S. space-booster development, has made its final recommendations. There appear to have been two basic conclusions.

The first is that the projected Titan III should be a more or less straightforward adaptation of the "storable" Titan II, with suitable reinforcement to accommodate the thrust of two 120-in. solid boosters attached to the base of the Titan first stage. A decision on this configuration would serve the double purpose of achieving a useful "interim" booster in the shortest practicable time, and of providing the necessary additional funds to speed the evaluation of large high-performance solid-propellent motors for possible use in clustered arrangement in future Nova-size boosters.

The largest solid-propellent rocket engine so far to be static tested in the United States is Aerojet-General's 100-in.-dia., four-segment unit, which has an overall length of 35 ft.; it is said to contain nearly 200,000 lb. of polyurethane propellent. Test-fired on a horizontal rig at Sacramento, Calif., on Aug. 6, the engine produced a full thrust of more than 500,000 lb. during 67 seconds of the 87-sec. run.

Part of the research and development work now being undertaken, and to which United Technology Corporation and Lockheed Propulsion Co. have been contributing, concerns the investigation of nozzle materials and methods of fabrication, thrust-vector control by fluid injection, and ignition.

The 120-in. engine is expected to result from a development contract shortly to be placed under U.S.A.F. aegis. Titan III is expected to be used for orbital testing of the Dyna-Soar boost glider following a programme of sub-orbital launchings with Titan II. NASA, which has an interest in the Dyna-Soar project, will also be concerned in the procurement of Titan as a booster for the Mercury Mk. II spacecraft which is being developed as a bridge between the existing Mercury capsule and the three-man Apollo spacecraft (THE AEROPLANE AND ASTRONAUTICS, Dec. 14, 1961, p. 768).

Designed to accommodate two men, Mercury Mk. II will follow the same basic configuration as the earlier space capsule but will have a base diameter of 83 in. Recovery of the 5,500-6,000-lb. vehicle may be achieved by one of three methods —a 96-ft. parachute, a cluster of smaller parachutes, or a glide-sail device of the type proposed by the Radioplane Division of Northrop Corporation. The last named consists of a parachute with a flexible flap permitting a degree of manœuvre during the final stage of recovery. A similar device is being considered for the recovery of the re-entry capsule of the Apollo spacecraft. The design objective for the Mercury Mk. II capsule is to permit manned orbital missions of up to 14 days' duration.

The second major recommendation of the Golovin Committee was to adopt the projected Saturn C-4 for development rather than the C-3. Not only does the C-4, with four Rocketdyne F-1 engines totalling six million pounds of thrust in its initial stage, offer more scope for development as a heavy booster, but it offers considerable promise for transporting heavy loads into orbit in support of orbital refuelling operations. Rendezvous techniques are now high on the agenda for investigation and initial experiments are scheduled to be made using the new Mercury capsule and the restartable Agena-B.

The announcement that the two-man Mercury spacecraft would be used for orbital rendezvous experiments was given from NASA's newly acquired Manned Space Flight Laboratory in Houston, Texas, on Dec. 8. A recent estimate suggests that preliminary costs would be about $500m. (£180m.). This, of course, would be in addition to the $500m. already committed to the present Mercury programme.

NASA expects that two-man flights in Mercury Mk. II will take place in the period 1963-64, starting with a number of unmanned ballistic launchings from Cape Canaveral. Manned orbital shots will follow, with experiments in orbital rendezvous coming towards the end of the programme.

Adoption of the Saturn C-4 will not necessarily mean the exclusion of the Nova booster. The Nova concept, which has been going the rounds of NASA for the past three years or more, is the booster-type which would perform a two-way mission to the Moon without the intermediary of orbital refuelling. Its launching thrust would be double that of Saturn C-4, or some 12,000,000 lb.

There is still no fixed idea at present of how this vehicle may eventually develop—whether, for example, its first stage would be liquid or solid—but NASA appears determined to keep the concept alive. By establishing firm contracts for the 120-in. solid propellent rocket engine in Titan III, and an operational requirement for the massive F-1 liquid-propellent rocket engine in Saturn C-4, the United States will have taken a firm step in the direction of the "ultimate" Nova vehicle without the need for coming to an immediate decision. It now remains to be seen how the Golovin recommendations fare in the budgetary allocations for fiscal year 1963.

"Ham" Satellite in Orbit

A SMALL satellite built by a group of American amateur radio enthusiasts was successfully launched into a polar orbit on Dec. 12 as a "pick-a-back" payload aboard the U.S.A.F. satellite, Discoverer XXXVI. It separated from the carrier and began operating as a separate entity as planned.

Given the name of Oscar, for Orbiting Satellite Carrying Amateur Radio, the satellite carries radio equipment which is transmitting a special signal for the benefit of amateur radio "hams" all over the World.

First to pick up signals was Mr. Hugo Spitt, an amateur operator at Forbes in New South Wales, Australia. He said the signals in Morse, spelling "Hi," were loud and clear. The satellite was within range for seven minutes, from 1.07 p.m. Australian Eastern time, and the signals were received on a frequency of 145 Mc/s. They were also being sent out on 54 Mc/s.

From No Bombs to H-Bombs

SINCE the beginning of armies man has sought for ways and means of out-ranging the arms of his enemies. Long before the appearance of the aeroplane in the skies a Jesuit monk, Francesco Lana, warned in the second half of the seventeenth century of the fearful potentialities of bombardment from the air but, although the Wright brothers flew at the end of 1903, it was not until 1911 that the aeroplane was used in war for bombing purposes.

In "Air Bombardment"* Air Marshal Sir Robert Saundby, Deputy A.O.C.-in-C. R.A.F. Bomber Command, 1943-45, has set himself to tell the history of air bombardment from Sindbad's roc (which sank a ship with a gigantic boulder) to the ballistic missiles of today. Air bombardment, as Sir Robert puts it, is the basic element of air power and this book considers its development against the military and political background of the last 50 years. The subject is vast and a treatise of many volumes could be compiled about it, but Sir Robert and his publishers have chosen to deal with the theme in "reasonable compass" and much that might have been of service has, as the author admits, had to be left out. This limitation of size, coupled with Sir Robert's clarity of style, have brought a complex subject within reach of a very wide circle of readers. It is to be hoped that a large proportion will buy it. It should certainly be a "must" for all readers of THE AEROPLANE AND ASTRONAUTICS. Those who recall Sir Robert Saundby's regular contributions to our pages will need no urging.

In less than 60 years the march of aeronautical progress has been at such a pace that the flying machine has been developed from the first primitive wire-braced birdcage of a biplane to the ultra-streamlining of today's near-sonic airliner and the first crude "bread-board" models of manned satellites have been put into orbit round the Earth. The World crouches under threat of the ballistic missile and hardly dares contemplate the implications of the launching of manned satellites. The prospect of a world living lazily, free from the threat of war, under the rule of Kipling's Aerial Board of Control, still seems a dream impossible of realization.

Frustration Between the Wars

It is against this background that Sir Robert has written his study. Not until the Second World War was well under way had professional fighting men learnt to take full advantage of the military potentialities implicit in the ability to move men and armament about in three dimensions. Much of "Air Bombardment" is given up perforce to the frustrations of the years between the Wars when political considerations prevented, at least in this country, any development of air bombardment. The Air Ministry, for instance, was not permitted to issue specifications for any aeroplane of more than 3,000 lb. unladen weight. This ludicrous figure should be considered in the light of the 4,000 lb. foreseen as the empty weight of the Beagle twin-engined executive aircraft.

As time goes on and air bombing becomes a subject which can be discussed with less emotion, it may well be that the most important aspect of air bombing in the past 50 years will be seen to be not the pasting this country received from the air but the ability the possession of a bombing force gave to these beleaguered islands to hit back. After reading this book it should be impossible not to appreciate what would have happened had the British not had the power to carry out strategic bombing.

At the beginning of aviation there were no suitable weapons for the fragile aeroplanes of the time and when the Italians first dropped bombs in anger on the Turks in 1911 the bombs were 4-lb. hand grenades. By the end of the Second World War complete aircraft were being used as bombs and, as the inhabitants of these islands know only too well, the first crude ballistic missiles had demonstrated their power to threaten from afar.

Today the ground-based missile has brought back the artillery man. Tomorrow the manned satellite seems certain to demand the skilled aircrew, directly descended from those of World War II. And this will still be true if, as all men devoutly hope, satellites are controlled by world authority for the purposes of imposing international peace.

Sir Robert's book begins with the dawn of military aviation in the First World War. When the fighting ceased Sir Robert notes that that war ended without providing any convincing proof of the offensive power of aircraft. It had been shown that bombers could penetrate enemy defences, up to the limit of their radius of action, but it had proved impossible to achieve the concentrated and sustained attack that the author believes could have been decisive. And many bitter years of frustration were to pass before the powers of air bombardment were either fully appreciated or correctly wielded.

As a pilot with the R.F.C. in World War I and a professional airman until his retirement in 1946, the author writes with first-hand knowledge of the futilities of the 1920s, of the success of control by air power in keeping the peace in the Middle East and of the panic expansion before and after Munich. Sir Robert states flatly that at that desperate time the R.A.F. possessed fewer than 50 modern twin-engined bombers and no four-engined bombers at all. There were fewer than 100 Hurricanes and only six Spitfires. What was even more terrifying to those of us who knew was the lack of orders in the industry and all that such lack implied as regards the long lines of supply from raw material to manufactured product. Even the breathing space obtained by Munich was not enough to make up for the lack of action in the years before. And just how short this country was of bombers the chapter dealing with the outbreak of World War II makes clear.

Sharp Lessons from Norway

Today the disastrous expedition to Norway seems very remote. This ill-conceived campaign was to some extent of secondary importance. It may have had no vital impact on the conduct of the war but it did have a profound influence on future military policy. After its sharp lessons the Admiralty was forced to recognize that command of the air over the sea was as important as command of the sea itself. The British Army also perceived the paramount importance of achieving air superiority in the battle zone, over base areas and along lines of communication. Once again this country had had to learn the very hard way and once again those who had been working for so long to introduce new thinking had only the hollow consolation of "I told you so."

As one with personal experience of the Beaver's methods at the Ministry of Aircraft Production, this reviewer has always thought that Lord Beaverbrook's achievements were never properly appreciated by the Royal Air Force, who were irritated by his unorthodoxy. It is certain that his methods were necessary to produce a real understanding of the urgency of the time and it is therefore good to see the tribute paid him in this book.

This opportunity will be taken of recording the view that his policies did not jeopardize the introduction of the four-engined bomber but in fact ensured the priority without which their well-planned production would never have been achieved.

The bulk of this extremely well written book is devoted to the work of Bomber Command in World War II, including one whole chapter devoted to operation "Millenium," the first 1,000-bomber raid. The effects of this incredible achievement when 11 aircraft a minute were over the target were far-reaching and, as the author makes clear, in the success of this raid can be discerned the beginning of the end.

The Efficacy of Strategic Bombing

One question that is always certain to arouse opposing views is the efficacy of the strategic bombing of Germany. It will be recalled that the chief outcome of the publication of the official Air Ministry history on the subject was a spate of critical notices denigrating the results. It is strange how critics of the bombing effort on Germany fail to perceive that the measure of success is not to be found in the amount by which production was reduced after each raid. A boxer does not expect to floor his opponent with every blow, much less to knock him out the first time. The simile seems exact. Just as it is the cumulative effect of blows in the boxing ring that counts, so in the bombing effort.

It may be distasteful to the layman to think along such lines, but it has always seemed to this reviewer that the only sensible way to evaluate the bombing effort is to set what it succeeded in doing against what it cost. Of course the distasteful aspect of this comparison is that it seems to involve loss of life and human misery as parameters. But heavy though the losses of Bomber Command aircrews were and heavy though the slaughter of the German population undoubtedly was, the military losses did not compare with the massacres in the Flanders mud of World War I, and during that war the Allies sought to starve the German population out.

In fact, success in war depends on depriving the enemy of the power of making war. Study of the bombing effort discloses

*"Air Bombardment," by Air Marshal Sir Robert Saundby. Chatto and Windus, 8½ in. by 5½ in., illustrated, 276 pp., 30s.

that the national man-hours expended on building bombers and their armament produced so much wastage of productive man-hours on the German side that it was decisive.

It is on such aspects that one could have wished for much more statistical information in this book. There are some extremely helpful appendices and in the next edition it would be informative to have set down some facts about the national efforts involved. The British figures are known and much information is certainly available about the man-hour figures for German aircraft production.

In the remaining chapters in his book Sir Robert discusses the air war in the Pacific and the vanquishing of Japan by air bombardment. The last three chapters deal with air power after the War, space weapons and finally war in the nuclear age.

As has been said the subject covered by the title is vast. It is a measure of the author's powers that he has been able to cover it so comprehensively. It is a subject which, though vital to survival of a nation, is not thought to be quite nice to talk about. Such inhibitions are strange, for without doubt it provided the only weapon with which this country, beaten to its knees, could fight back with. It broke great military powers.

Today the threat of all-obliterating bombardment from the air holds the World in an uneasy peace. As Sir Robert concludes, the story cannot end there. If the civilized world is to survive it must set up some form of international judicial authority. One should add that the ultimate sanction exercised by such an authority would certainly be control by air power.

T.J.

Aviation News in General (continued)

NORTH AMERICAN'S YEAR.—Non-aircraft programmes accounted for about 62% of North American's record sales figure of $1,262,333,263 for the 1961 fiscal year. Net sales by divisions were: Atomics International, $52,347,052; Autonetics, $410,147,961; Columbus, $133,776,710; Los Angeles, $377,667,486; Rocketdyne, $180,250,168; Space and Information Systems, $108,143,886. Assembly of the prototype B-70 Valkyrie Mach 3 bomber is under way at Los Angeles. First flight is planned for late-1962.

HANOVER FAIR.—The 1962 Hanover Fair with its associated air show is to be held from April 29 to May 8.

VERTOL USES.—The six Boeing-Vertol 107s on order for the Swedish armed forces, the first for Europe, are designated HKP-4. Two of them, specially equipped for anti-submarine and mine countermeasure missions, will be operated by the Navy. The Air Force will use four in the general carrying rôle. All six will be capable of carrying 10,000-lb. loads externally and will have two 500-gal. extended range fuel tanks mounted on their stub wings.

MORE ALOUETTES.—Sud Aviation is expected to receive a contract for another 12 Alouette IIIs for the French armed forces who will then have 22 on order. Total Alouette III orders will then be 68.

ATLANTIC HOURS.—By Dec. 4 the prototype Breguet Atlantic had logged 40 hr. in 24 flights. It first flew on Oct. 21

PIPER OPENING.—At its Lock Haven, Pa., headquarters Piper has opened a new $1 million engineering centre. The 41,500 sq. ft. facility houses engineering offices, experimental fabrication, static and flight test operations. Also included is hangarage for 12 experimental aircraft. The new centre will concentrate primarily on twin-engine and high-performance single-engine aircraft.

RESCUE 'COPTERS.—To be operated by the Air Rescue Service of MATS, 59 more Kaman H-43B Huskie helicopters have been ordered by the U.S.A.F. This, the fourth major production contract for the Huskie, brings the value of orders to about $70 million. More than 80 rescues are credited to the type and its crews since it entered service 18 months ago.

TALON POWER.—General Electric has been awarded a $34.4 million (£12.3 million) contract for production of J85-5 turbojets for the Northrop T-38 Talon trainer.

MUSEUM PIECE.—The "Sacred Cow," the U.S.A.F. C-54 which was once the personal transport of Presidents Roosevelt and Truman and also carried many other V.I.P.s, was handed over to the National Air Museum of the Smithsonian Institution on Dec. 4. The aircraft was delivered to the U.S.A.F. Air Transport Command in June, 1944; it officially retired from service last July.

Commercial Aviation Affairs (continued)

M.E.A.-LUFTHANSA.—A pool agreement has been concluded between M.E.A. and Lufthansa for the Beirut-Frankfurt services. A combined daily frequency will be offered from Jan. 1.

FREIGHT BOOM?—B.O.A.C. reports a boom in its trans-Pacific freight traffic, which was 500% higher in October than in the same month a year ago. T.C.A. freight on all routes set a new record in October at 3,425,000 lb., 22% above the October, 1960, level.

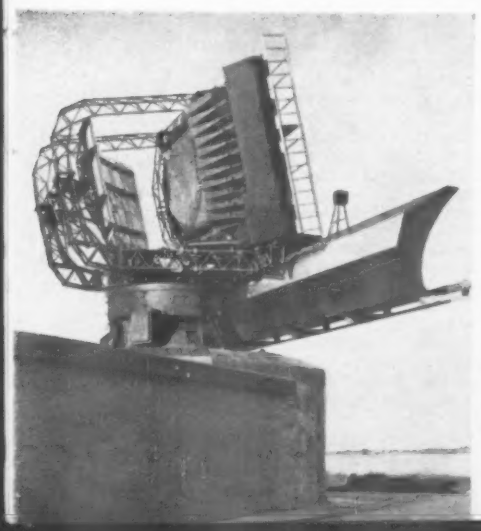
SICILIAN AIRPORT.—A larger civil airport for Trapani, Sicily, came into operation last month. Constructed mainly with NATO funds, this airport, Birga, has a runway of 8,760 ft. and has now replaced Chinisia, which was inadequate for regular services. Trapani will now become a traffic point on the Palermo-Pantelleria-Tunis service.

RADAR SALE.—Surcim Airport, to replace Zemum as the airport for Belgrade, is to have a Cossor CR.787 airfield surveillance radar. It is expected to be in commission in two months' time.

NOISE FORUM.—Stansted Airport and B.E.A. recently tackled the local noise complaints problem in a new and friendly way. A large group, including "protestants," was invited to Stansted, where the various problems were explained. Then 63 of the visitors were taken for a 15-minute training-circuit ride in a Vanguard before further discussions.

CONVAIR HOURS.—Up to the end of October, 46 Convair 880s in airline service and one with the F.A.A. had totalled 75,870 flying hours since May, 1960, when scheduled services began.

ICAO 7th COM.—The Communications Division of ICAO will hold its seventh session in Montreal from Jan. 9, 1962—and not this month, as we accidentally caused "C.C.J." to say in his column for Dec. 7 (p. 721).



TACTICAL CONTROL.—One of a number of tactical control radar stations designed by A.E.I., in conjunction with R.R.E. Malvern, for the R.A.F. Bloodhound SAM system. Developed around this volumetric aerial, semi-automatic three-dimensional displays, high-speed data storage and computing equipment, the complete system includes early warning radar and precision auto-follow target illuminating radar.

A.T.L.B. Decisions and Applications
(Scheduled Services only.)

Licence Suspended.

A269/1 Starways. Glasgow-Ostend. Until May 31, 1962.

Applications.

A2140. Westpoint Aviation. London (Gatwick)-Exeter. Tourist class passengers, cargo and mail by Dakota or Argonaut. Seven a week, 1962 to 1967.

A2222. East Anglian Flying Services. Southend-Palma. I.T. passengers only. Viking, Viscount, DC-4 or Carvair. Three a week, May to Oct., 1963-1970. IATA fares.

A2223. East Anglian Flying Services. Southend-Basle. Details as A2222 above. Oct.-Mar., 1962-1969.

A2224. East Anglian Flying Services. Southend-Barcelona. Details as A2222 above.

A2231. Silver City Airways. Birmingham-Newcastle. Tourist class passengers, cargo and mail, by Viscount or Dakota. Three a week, June 1963-May 1969. (Replaces Air Safaris' licence A173.)

A2232. Silver City Airways. Jersey-Guernsey (opt.)-Birmingham. Tourist class passengers, cargo and mail by Viscount or Dakota. Up to three a fortnight, May to Sept., 1962-1969 (replaces Air Safaris' licence A175.)

A2337. Bournemouth Air Taxi. Bournemouth-Sandown. Economy class passengers and cargo, by Rapide. Up to four a day, 1962-1969.

Personal Flying

AN international light aircraft fair is being held at Skovlunde, the main Danish airport for non-commercial flying, in June, 1962, by the Copenhagen Private Flying Club. Skovlunde now belongs to the city of Copenhagen, and is to be extended to relieve pressure on Kastrup. Most of the buildings and a large area of the field will be used for the fair, which will take place between June 1 and 11, and will include radio and all types of equipment associated with maintenance, air traffic control and rescue.

The organizers, under the patronage of H.R.H. Prince Axel, will show the great development taking place in light aircraft flying throughout Scandinavia and Northern Europe.

• • •

Latest addition to the Tiger Club, and currently housed at Redhill, is an American Cosmic Wind racing aircraft. This is one of four built by Tony Le Vier and Associates Inc., a group of Lockheed test pilots and engineers, especially for the immediate postwar racing events in the United States to the Goodyear Formula.

The rules for these races specified the use of a limited capacity engine, which in Cosmic Wind "Ballerina," now the property of the Tiger Club, is an 85 b.h.p. Continental. On this, "Ballerina" flies at nearly 200 m.p.h., and climbs at 3,000 ft./min. It is also fully aerobatic, being stressed to more than 9g, and is to be entered for the 1962 Lockheed Aerobatic Championships as well as the National Air Races. It will be made available to Tiger Club pilots at £10 an hour.

• • •

The American Civil Aeronautics Board reports that there were 4,576 aircraft accidents in general aviation operations during 1959, the most recent year for which records have been completed. Of this total, 450 were fatal, involving the deaths of 823 persons. Although the total accidents decreased slightly compared with the previous year, the number of fatal crashes increased from 398, with over 100 more deaths.

With an estimated 12.4 million hours flown by the 70,000 or so general aviation aircraft, the total accident rate was 36.9 per 100,000 hr., and the fatal rate 3.63. Corresponding figures per million miles were 2.77 and 0.27. Of the overall total of accidents, 4,149 were to small aircraft (below 12,500 lb. a.u.w.), which suffered 378 fatal crashes and 719 fatalities.

HOT BREEZE.—The Tiger Club's Cosmic Wind racer, which does nearly 200 m.p.h. on 85 b.h.p.

• • •

● Weather during the past two months seriously affected the flying programme of the Oxford Aeroplane Club, which nevertheless managed to complete nearly 1,400 hr. in that time. Instrument flying training is being encouraged at the moment, and with its extensive fleet of aircraft, including Tri-Pacers, Colts, Chipmunks and, in the near future, an Airedale, the club is well equipped for all types of operations.

Gliding Notes

by Dr. A. E. Slater

A GLIDING club exclusively for girls has been opened in India, Mr. Dinesh Chandra writes from Delhi. It is actually a gliding *and* flying club—or, as one might more explicitly put it, a club at which some of the flying will be mechanically assisted. It was opened on Dec. 3 at Banasthali School for Girls in Rajastan, when a display was given by the club's own Rohini (an Indian design somewhat resembling the T-21) and an As-1 from Delhi.

They have a male gliding instructor, Mr. R. K. Wason, formerly of the Delhi Gliding Club.

Mr. Chandra thinks that this must be the only gliding club exclusively for girls in the World. So far as I know, it is at present, but the question whether it is the first depends on the definition of a club.

At the 1932 German national contests on the Wasserkuppe there appeared a party of ladies operating a Kassel 20 sailplane named "Boy." They were known as "Martha Mendel's Damengruppe" (not "-truppe") and all wore trousers. Martha herself appeared to do all the flying, and the other Valkyries acted as her ground crew without male help, usually doing everything at the double. The group was sponsored by the Mittelrheinische Verein für Luftfahrt and entered in the "practice competition."

According to reports in *Flugsport*, "Boy" made four flights during the fortnight's meeting, the longest being of four minutes. Here is an unofficial record which the Banasthali ladies should find it easy to beat when national gliding contests start in India.

Major Yuri Gagarin, the Russian spaceman, visited the Delhi Gliding Club on Nov. 30, when a display was staged for his benefit, and he afterwards had tea with the members and gave a talk on his space flight. Mr. Chandra does not say whether he was asked questions about the distribution of convection clouds which he saw down below.

D. P. Sori started the display with mild aerobatics on a Rohini; Miss Raj Mitroo flew an Indian-built Olympia; Sqn. Ldr. I. S. Loughran gave the whole works, including a barrel roll, on a Polish Bocian; and the Ashvini took off on an Indian-built winch powered by a 120-h.p. Dodge. Maj. Gagarin then renamed the Rohini "Friendship." But he did not, apparently, take a flight; perhaps he was put off by the absence of any decelerating mechanism for the approach to land.

* * *

ARGENTINA'S offer to hold the next World Championships in 1963 involves much generosity in addition to the labour of organizing the meeting. They are charging no entrance fee and have offered to contribute to the travel costs, and for those who do not bring their own sailplanes there are 30 Ka-6s, two Skylark 3s and a Skylark 2. All retrieving will be by aero-tow, for which the government is providing 30 tugs, and they are also getting two Zefirs and two Fokas from Poland for the Argentine team. Three entries per nation are allowed, distributed as they like between the Open and Standard Classes.

* * *

SWEDEN'S national contests at Aalleberg included five competition days. L. Frederiksson in a Zugvogel won with 4,404 points; P. Axel Persson came a close second with 4,399 points flying the same Weihe with which he became 1948 World Champion in Switzerland; and Irve Silesmo, the 1954 Swedish Champion, flew a Ka-6 to third place with 4,341 points.

Individual winner in Germany's decentralized contest for 1961 was Emil Bucher of Eislinger, and in the *Nachwuchs* class (literally "aftergrowth" but it means up-and-coming) Heiner Neumann of Berlin. Brunswick won the team championship with pilots Bjorn Stender, Rolf Kuntz and Othmar Heise; Augsburg was second, Bielefeld third.

* * *

A CHARTER flight to enable members of the Soaring Society of America to visit European gliding centres during 1962 has been proposed, and Canadian gliding people are being asked through the Soaring Association of Canada if they want to join.

* * *

AT a "technical symposium" held by the Soaring Society of America at Los Angeles, Bruce Carmichael read a paper on "Possibility of a one-foot-per second sinking speed." He decided that auxiliary muscle power would be necessary, and based his conclusion on past history, especially the Haessler-Villinger machine of 1935. The successful Southampton and Hatfield designs, which have reduced the sink to zero, had not flown at the time.

The late Dr. August Raspet's famous paper on "New Approaches to Soaring" two years ago looked to future possibilities rather than past certainties; he suggested using power to preserve laminar flow, converting solar energy (which shines on the wing's upper surface at the rate of 0.2 h.p. per sq. ft.), and extracting energy from turbulence.

Correspondence

Collaborative Trends

MR. GREENWOOD was refreshingly quick, last week, to seize on my enthusiasm for the British aircraft industry and its excellent teams of technicians as an opportunity to wave his own flag for collaboration in satellite and space matters. In doing so, however, he is wrong to assume that I have not grasped the "main reason" for the collaborative agreements mentioned in my letter. I can assure him that the hard facts of British aeronautical life have not escaped me; nor has the danger of potential side-effects which are likely to spring from too wide a dissemination of our technical know-how.

What concerns me is not so much the collaborations as such, but their concomitant effect on the teams concerned. The cake we are both referring to has some attractive icing on the outside; it is to be hoped that when it is cut it does not turn out to be humble-pie.

London, W.1. F. THOMAS.

Vital Angle-of-attack Instrumentation

THE author of your column "OPtional Reading" has performed a useful service in his discussions of the jet transport landing problems. I am surprised that he brushed off rather lightly the advantages of flying angle of attack in the low-speed regime.

The importance of angle-of-attack instrumentation has been recognized by the United States Navy and the Royal Navy for their carrier-borne jet aircraft—an operation where the highest skill is barely adequate and no improvement in instrumentation can be ignored.

I have worked in the aircraft instrument field for many years and am convinced that continued operation of jet transport aircraft without reference to angle of attack during both approach and take-off is a denial of a valuable aid to safety. I think several recent accidents prove my point rather too well. I venture to set forth below a few personal opinions.

For the rather specialized case of the larger jet transport aircraft I think some fundamental improvements in flight data instrumentation are overdue. I am not referring to mere changes in dial layout. Both angle of attack and airspeed are hard to fly, especially during the landing approach. A simple presentation of these parameters is insufficient and combined presentations are confusing.

In my opinion the type of improvement that is needed requires, for example, a judicious mixture of angle of attack and rate of change of angle of attack. The same is true of airspeed. By the addition of a lead signal the pilot can be given trend information so that he can be relieved of the task of estimating visually the rate at which he is approaching or departing from his desired condition. The engineer would give this information to a mechanical servo, but the poor pilot is left to guess at rate of change.

Technically, the problem is not an easy one. This is partly because the rate of change is so slow that it is difficult to filter out the unwanted "noise" and partly, as the author of "OPtional Reading" has pointed out, because of the necessity of recognizing properly the added load factor during manœuvring. A mixed signal presentation has been used with some success in one form of vertical-speed indicator.

The array of instruments that are supposed to help the pilot does not, in my opinion, pay proper regard to the fact that, once configuration is fixed, the pilot has only two significant controls for movement in a vertical plane. They are the control column and the power lever. On take-off one might go further and say that, since all available power has already been applied, the poor man is left with but one significant control—but how many instruments?

Going back to the approach, since that is where "OPtional Reading" has been concentrating, it may be the case that the instrument that is required is one which tells the pilot how to move his power lever. This instrument would tell how to set power so that the "correct" angle of attack is held while the pilot manœuvres the airplane to follow the desired glide slope and heading. The signals displayed would recognize the rate at which the airspeed must be changed and the sluggishness with which the aircraft responded to power changes.

Unfortunately, all these instrument improvements cost money that aircraft operators are unwilling to pay. It must be recognized that the military are little interested in financing any programme that is peculiar to the non-combat aircraft.

We are flying high-performance modern aircraft, filled with increasing numbers of passengers, with air-data instruments that are little more than warmed-up versions of those installed 20 years ago. Their design approach is primitive and ignores dynamic requirements. Small wonder that the writer of "OPtional Reading," who must be an airline captain, has problems. Has he ever studied the design of the jet engine fuel controller and realized how much clever design there has helped him? The same degree of help could be forthcoming from his air-data instruments.

Long Island, N.Y. IVAN O. FIELDGATE.

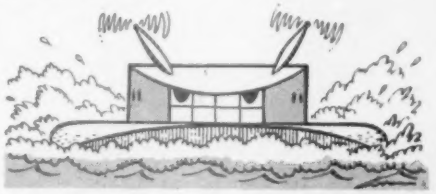
Groundabout

Too Flamin' True. Recently I visited John Crewdson and his merry men out at Bovingdon, where they're flying three B-17 Fortresses for the film "The War Lover." The old-timers are now wonderfully reliable and flying beautifully but the collecting of them was a little on the hairy side. The pilots, including John, checked out pretty briefly before flying them across the Atlantic. Nearing Portugal, one of his engines caught fire and he radioed the news to one of the other pilots, an Australian. If John was expecting sympathy, he was disappointed. The Aussie commented," O.K., Blue—you're checked out *now*! "

*

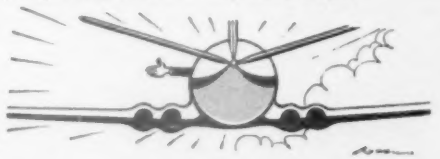
ARBitration in Extremis

"Well, let's call it a Horrorcraft, then we can give it an X certificate. . . ."



*

Driven to it. During a recent London Airport strike, involving passenger coach drivers, pilots helped to keep things going by driving the coaches. Knowing that these things are not lightly forgotten, the moment I hear of a pilots' strike I shall immediately cancel any flight reservations I may have made.



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On the Spot. The organizers of the recent census of aircraft flying over the U.K. could have got a lot of help from the aviation enthusiasts scattered throughout the country. These lads, young in age and/or heart, are the modern equivalent of the railway spotters, a sort of dedicated, private enterprise Observer Corps and little that is new or unusual in the sky or on the ground gets past them. I've been sent a copy of "Wrecks and Relics," a 10-page booklet produced by the Merseyside Group of Aviation Enthusiasts and listing almost every collector's piece of horseless aerodyne in the U.K. For instance, do you know where you can see the remains of some Westland Wallaces? And that there's an Avian in Huddersfield? Or that bits of the Helmy Aerogypt 4 serve as a hen-house near White Waltham? *Note*: "The Aerogypt was damaged while landing at Northolt 26.11.46 and was later dropped from a crane. Its usefulness ended at this point."

*

Christmas Past for Christmas Present. One *new* old type the spotters can add to their list is the Monospar which flew here from Australia and is now advertised for sale in *Popular Flying*. This "man-sized 4-seat twin didgery doo blue job" comes complete with such aids as "VHF, tastefully curtained windows and kangaroo emblem on fin."

Wg Cdr

Industry Record

K.D.G. Expands

Design and manufacture of all types of diaphragms, capsules and pressure elements in various sizes and thicknesses and in such materials as stainless steel, beryllium copper and phosphor bronze is now being undertaken by K.D.G. Instruments, Ltd.

In the past the company has produced these components purely for use in their own range of pressure indicating and control instruments.

In connection with this expansion K.D.G. has appointed Mr. R. W. Bailey as assistant chief engineer of the pressure element department. Mr. Bailey is well known for his work in this field. From 1955 he was chief development engineer of the diaphragm and capsule section at Kelvin, Ltd.

What the Eye Cannot See . . .

To its range of Andrex portable X-ray units the industrial division of Watson and Sons (Electro-Medical), Ltd., has made four additions.

One of these covers the whole range of low-kV. radiography from 10 to 80 kV. The makers claim that it is ideal for aircraft radiography and in particular for the examination of very thin aluminium for corrosion. It is also well suited for the critical examination of plastics, graphite and any type of non-metallic material; it can also be used for steel of ¼-in. thickness.

The tubehead of this unit weighs only 28 lb. and incorporates high tension transformers and the beryllium window X-ray tube. Water cooling is an optional extra. Automatic protection against overheating of the tubehead and sudden variations in the mains supply is provided for.

Of the other three the 250-kV, 6-mA unit has a tubehead weight of 156 lb.—more than 100 lb. less than the previous model. Beam angle is 60°, enabling two 15-in. films to be taken at a focus/film distance of less than 30 in. This feature, together with the 6-mA tube current, means a substantial increase in footage of welding that can be radiographed in a day.

The 250-kV./360° 5-mA unit is for the examination of circumferential welds in steel of up to 2 in. thick. The 360° band has an effective width of 40° and a "forward throw." A lead belt with radiation port enables the unit to be used for directional work.

The last of the new models is a 180-kV. 8-mA unit. This has a tubehead weight of 93 lb. The high tube current represents a considerable advance over earlier portable units. Like the 250-kV. 6-mA unit it has a 60° beam angle with similar capabilities.

Pressure Cabin for One

Collaboration between the R.A.E. and Siebe, Gorman and Co., Ltd., has led to the development of a high-altitude full pressure suit for R.A.F. pilots for use in the event of cabin pressurization failure.

At altitude when such an emergency occurs a barometric trigger automatically inflates the tubes on either side of the suit's helmet causing the facepiece to snap shut immediately (see illustrations). The outflow of ventilating air—under normal uninflated conditions this is circulated around the suit to keep the occupant in a comfortable environment— is then controlled and the suit inflates to a pressure sufficient to permit the wearer to remain at altitude for a considerable period. Pressure is adjusted by means of a control valve on the thigh of the suit.

The suit is made from thin rubberized silk and has a separate outer restraining cover of Tervlene. The clear facepiece of the helmet section is of Melinex, a sheet Terylene, which crumples and stows into a very small space when the helmet is open, but when closed is pulled out and becomes creaseless. Should the pilot have to eject, the Melinex is flattened against his face by the blast to form a protective skin.

Left, the Siebe, Gorman full-pressure suit in a normal uninflated condition. Right, the suit inflated and helmet shut as it would when a cabin pressurization failure occurs.

Complete mobility of joints within the suit—at the elbow, shoulder and knee, is achieved by carefully tailored folds and gussets. An arrangement of webbing stays counteracts the end loads on the sections.

At its Chessington factory, the Siebe, Gorman Company has made a number of these suits for the R.A.E. An example was first shown publicly at the S.B.A.C. Show at Farnborough in September.

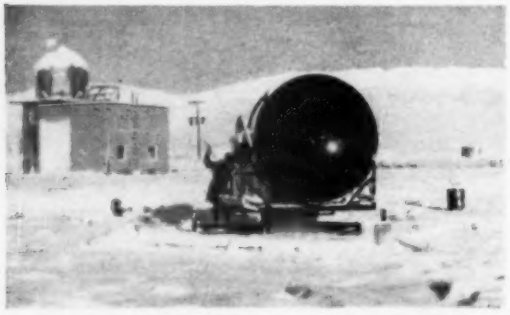
Dunlop in India

Tyres for the Boeing 707 are now being manufactured in India at the new aero tyre plant of the Dunlop factory at Sahaganj where production began on Nov. 30, the factory's silver jubilee. Since production began in 1936—it was the first large-scale tyre manufacturing enterprise in India—the Sahaganj plant has to date turned out more than 104 million tyres of various types.

Teddington Transfer

On Nov. 27 the gauging divisions of Teddington Industrial Equipment, Ltd., were transferred as a unit to Teddington Aircraft Controls, Ltd. This change, says the company, has been made so as to provide increased manufacturing, development and design facilities for Teddington air gauges.

All correspondence concerning this line of products should now be addressed to: Teddington Aircraft Controls, Ltd., Cheapside Chambers, Cheapside, Reading, Berks.



Installation of a Decca WF 2 windfinding radar at Narssarssuaq, Greenland, by the Danish Meteorological Institute has been made to provide more frequent and accurate upper wind information for the increasing traffic on trans-Polar air routes.

Aviation Calendar

1962

Jan. 1

London.—Institute of Transport, Metropolitan Section lecture, "Development of an Airport," by M. G. Housage, at 80 Portland Place, W.1, at 17.30 hrs.

Jan. 4

London.—British Institution of Radio Engineers, Radar Group lecture, "Automatic Techniques in Civil Airline Communications Systems," by W. E. Brunt, at the London School of Hygiene and Tropical Medicine, W.C.1, at 18.30 hrs.

Jan. 5

London.—R.Ae.S. Rotorcraft Section lecture, "Rotating Aerofoils and Flaps," by Dr. S. Neumark, at 4 Hamilton Place, W.1, at 18.00 hrs.

Jan. 9

Luton.—R.Ae.S. Branch lecture, "Agricultural Aviation," by Air Cdre. A. H. Wheeler, in the Napier Senior Staff Canteen, Luton Airport, at 18.00 hrs.

Jan. 11

London Airport.—R.Ae.S. Branch Brains Trust, at B.O.A.C. Headquarters, at 18.00 hrs.

London.—Northampton College of Advanced Technology lecture, "Vickers Aircraft," by H. H. Gardner, at St. John Street, E.C.1, at 13.30 hrs.

Company Notices

NEW COMPANIES

Royal Air Force College Flying Club, Ltd. (708,723).—Reg. Nov. 22, as a company limited by guarantee without share capital. Original number of members is 25, each being liable for £1 in the event of winding up. Income and property of the company whencesoever derived shall be applied solely towards the promotion of its objects. The management is vested in a Committee, first members of which are: Wg. Cdr. C. F. Green, Gp. Capt. E. H. Lynch-Blosse, Flt. Lt. J. R. Avers and Flt. Lt. A. G. Liddle, all of Royal Air Force College, Cranwell, Sleaford, Lincs. Sec.: Flt. Lt. A. G. Liddle. Reg. off.: Royal Air Force College, Cranwell, Sleaford, Lincs.

Rydair, Ltd. (709,334).—Private co. Reg. Nov. 29. Cap. £100 in £1 shrs. To carry on the business of owners and operators of aeroplanes. Sec.: Jean A. Dickie. Sols.: Rutherfords, S.W.1. Reg. off.: 8 Eccleston Square, S.W.1.

INCREASES OF CAPITAL

Aircraft Tanks, Ltd. (366,579), sheet metal workers, etc., 79 Mosley Street, Manchester.—Increased on July 3, 1961, by £19,900 in £1 shrs., beyond the reg. cap. of £100.

Bristol Aircraft Services, Ltd. (652,820), Stonebridge House, Colston Avenue, Bristol, 1.—Increased on June 26, 1951, by £1,749,900 in £1 ordinary shrs. beyond the reg. cap. of £100.

RECEIVERSHIP (APPOINTMENT)

Claydon Aviation, Ltd. (616,902), 236 Old Bedford Road, Luton.—Ean C. Baillie, of 23 Blomfield Street, E.C.2, was appointed receiver and manager on Nov. 6, 1961, under powers contained in debenture dated Dec. 17, 1958.

New Patents

APPLICATIONS ACCEPTED

888,159.—**A.C.F. Industries, Inc.**—"Simulated flight training apparatus." Mar. 21, 1960. (May 18, 1959.)

888,102.—**Blackburn Aircraft, Ltd.**—"Mechanism for facilitating the closing of doors and similar closure members into apertures liable to distort while open." July 13, 1960. (Sept 17, 1959.)

888,168.—**G. B. Bathurst.**—"Aircraft." Oct. 9, 1958. (July 9, 1957.)

888,073.—**P. M. Hughes.**—"Jet propulsion engines." Aug. 23, 1960. (June 4, 1959.)

Printed specifications of the above will be available on Jan. 24, 1962, and the opposition period will expire on April 24, 1962.

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Merry Christmas
and happy
landings in the
New Year
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PIPER aircraft on view, cars taken in part-exchange. Terms. Maidenhead Autos, Bath Rd., Taplow, Maidenhead 4900. zzz-801

FOR sale. Executive de Havilland DOVE, low time airframe, zero time SMOH engines, all mods. complete, new interior, exterior redesigned and painted. Box A115, care of THE AEROPLANE AND ASTRONAUTICS. 618-13

TWO low-houred DOVE Devon aircraft, easily converted to Mk. VI.

PROCTOR Mk. V, 12 months' Certificate of Airworthiness.

MESSENGER and Gemini spares.

APPLY: Derby Aviation, Ltd., Derby Airport. 618-710

FOR sale. G44 SUPER WIDGEON, six place amphibian, long-range tanks, V.H.F. (dual omni.), A.D.F. and L.F. radios, extensive reconditioning just completed. Box A114, care of THE AEROPLANE AND ASTRONAUTICS. 618-12

PETER S. CLIFFORD AND CO., LTD., offer:—

£5,500.99 CESSNA 180 airframe hrs. 709, engine time airframe, zero time SMOH engines, all mods. complete, new interior, exterior redesigned and painted. Box A115, care of THE AEROPLANE AND ASTRONAUTICS. 618-13

£1,450. MILES GEMINI Cirrus Minor 11A engines, airframe hrs. 1,550 engines 500 and 70, full blind flying panel, STR9Z, a first class example of its type.

FURTHER details on request. Oxford Airport, Kidlington, Oxford. Kidlington 3355. Bletchington 392. 618-1

FOR sale, PBY5A, converted to 285 ACF Cat., seating 10 passengers and three crew, wide cargo doors, dash 94 mod. P. and W. engines, large list of spares. Box A113, care of THE AEROPLANE AND ASTRONAUTICS. 618-11

TWO Douglas C47 aircraft for sale or lease, cargo doors American registered inspect Luxembourg. Astraeus Ltd., 167 Victoria St., London, S.W.1. Victoria 1403. 618-6

FOR sale, 1960 SUPER G BEECHCRAFT, total time 500 hrs. since new, features full instrumentation radios, long-range tanks, convertible executive five-seat interior to nine place high density seating. Box A112, care of THE AEROPLANE AND ASTRONAUTICS. 618-10

CESSNA 310B 1,300 hrs. T.T. on airframe 400 hrs. on each engine since o.h., immaculate blue and white, full C. of A. any inspection, fully equipped with auto pilot, 2 V.H.F., 1 A.D.F., 1 V.O.R., 3 light Marker Bn., De-ice and all the usual extras, £15,750. Box A181, care of THE AEROPLANE AND ASTRONAUTICS. 618-717

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LIGHT aircraft required, preferably without certificate of airworthiness. State particulars and price to:—

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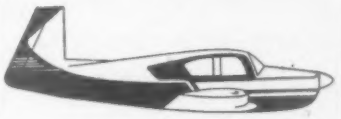

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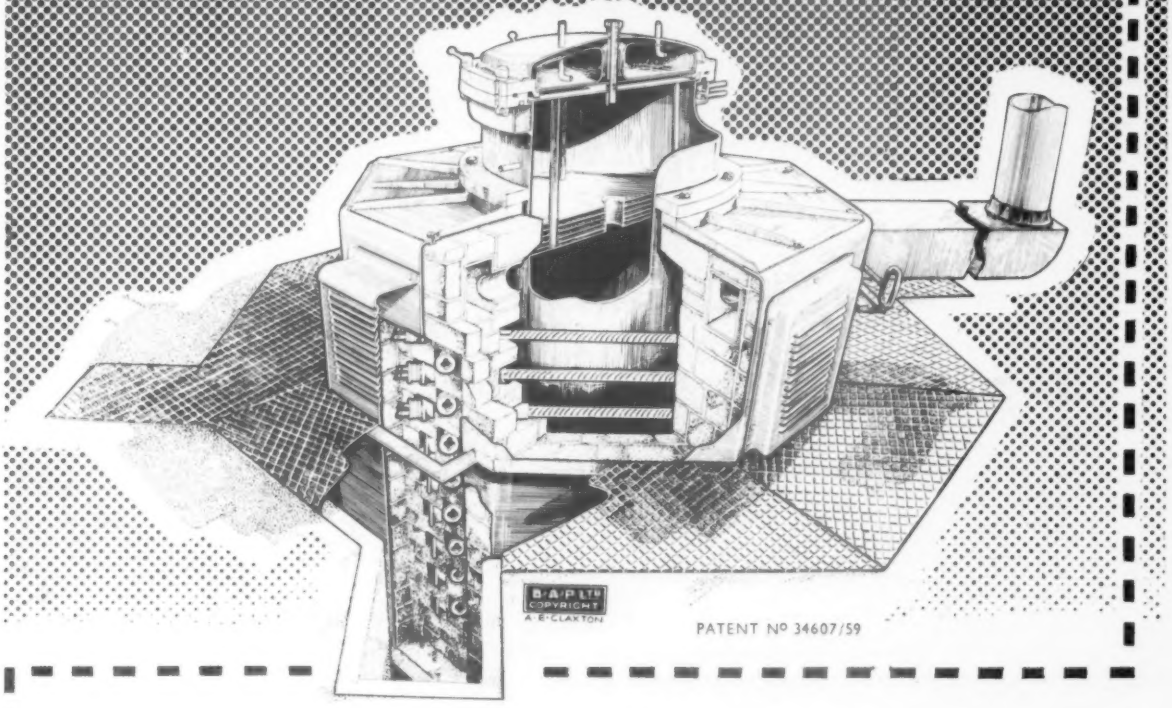

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